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The Farmer's Digest

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Volume 8 October, 1944 Number 5

Swine Project Speeds Improvement

Condensed from American Hampshire Herdsman

L. M. Winters

University of Minnesota

SEVEN years of work in the Minnesota swine breeding project have demonstrated that the rate of livestock improvement can be increased markedly. Since the project began in 1937, an old highly inbred line has been revitalized; six new inbred lines have been developed; one promising new line was developed from a crossbred foundation, and three times as much purification has been accomplished as was developed during the past sixty years by old methods.

This was accomplished chiefly by use of two old tools in livestock breeding: (1) inbreeding and (2) exacting selection for performance. These constitute the basic tools of the livestock breeders, but since they are old tools, improvement in their use must come through resharpening and reshaping them.

At the Minnesota Station, in co-operation with the USDA Regional Swine Breeding Laboratory, the work has been centered on (1) an attempt to improve one breed by working from within that breed and (2) an attempt to cut across breed boundaries and combine the desirable traits of two or more breeds.

Emphasis was placed on inbreeding because it has been demonstrated in plants and laboratory animals that inbreeding is the quickest and most certain means of purifying hereditary material to assure more certainty and uniformity in breeding performance. Inbreeding purifies, however, for both superior and inferior traits and has the general effect of reducing all the elements of vigor. Rigorous selection, therefore, was used, not only to retain a preponderance of good traits, but also as a balance-wheel to offset the drastic effects of inbreeding on vigor.

Reprinted by permission from American Hampshire Herdsman, July, 1944, Peoria, Ill.

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A reason for trying to improve one breed from within and, on the other hand, for going across breed boundaries by crossing breeds for foundation stock was to contrast the two methods. The general assumption has been that most any change desired can be accomplished through selection alone. On the contrary, if a given trait is absent in a given breed, the only solution is to obtain it from a breed which has the trait. A further possibility was that even a breed which could be improved by selection from within could be improved faster by going across breed boundaries.

The work at our experiment stations has been directed toward developing definite lines or families so as to have groups of animals which possess considerable uniformity in breeding performance. A line is a group of animals formed arbitrarily and then perpetuated by mating only animals within that particular group or family.

Performance (ability to make pork economically) was given a priority over little details of appearance which have no economic importance. All foundation stock was used the first year without inbreeding, and the performance of several of the foundations proved so poor that they were dulled before the inbreeding was started.

A *flexible system* of inbreeding has been followed. Instead of any fixed system, such as a full brother-sister or half brother-sister scheme, matings are based on an attempt to use the best performing animals. It resembles Robert Bakewell's old system of "mating the best to the best" except that the matings are kept within the respective lines and "best" here means best in performance.

Selections with and between lines are based on performance, appraised on: (1) *fertility,* (2) *survival,* (3) *rate of gain,* (4) *feed per unit of gain, and* (5) *body form.*

At birth each pig is ear notched with its own individual herd number. Each litter is reared in an individual pasture lot, about one-fourth acre in size, and detailed records kept of rates of gain, feed consumption and other items.

Through 1943 a total of 1,248 litters had been farrowed. From 200 to 215 litters are now farrowed each spring, but only about half are carried through the season. The remainder are culled at weaning on the sole basis of size of litter, one of the most important economic characteristics.

In 1937 we already had a line of Poland Chinas which was the most highly inbred group of farm animals on record, but it was not performing satisfactorily. Two

sublines of the main line were then crossed. This lowered the inbreeding, but revived the general vigor of the line. Since then it has been bred from within by the *flexible system*. For the past three years this line has been performing remarkably well.

Twelve new lines of Poland Chinas were started in 1937, seven of which have been discarded through the policy of severely culling both individuals and lines for performance. Recently another inbred line has been developed from a cross of two inbred Poland China lines. Experience with this line indicates that the method may be used to build better lines from those on hand.

Lines from Crossbred Foundations

To determine what could be done by cutting across breed boundaries, a cross was made between the Danish Landrace and the Tamworth. Following the first cross the stock was bred entirely from within, the line being known as Minnesota No. 1.

This No. 1 line is far enough advanced to be recognized as a definite line and has attracted considerable attention. This is due both to distinctive appearance of these hogs and to their having been developed so rapidly from a crossbred foundation. Their performance has been good. The color is red with occasional black spots. They are long bodied, short legged and light jowled. The quality of carcass is good. The line appears to be at its best if crossed with old breeds.

The practical man will ask, "What are these inbred lines good for?" It is a fair question, because unless the lines can be made to work in the field, neither the methods used nor the lines themselves will contribute to practical agriculture.

It was anticipated at the outset that the inbred lines would be of most value when crossed within their own breed and between breeds. Considering the wide differences in performance between the crosses it is logical to expect that far better than average results will be obtained after the best crosses have been determined.

Pigs weaned per litter varied from 5.5 to 11 pigs between seven different crosses made in 1943. Average 56-day litter weight showed a variation of from 178 to 425 pounds. Average 180-day weight per pig varied from 198 to 287 pounds. Feed per 100-pound gain varied from 277 to 373 pounds.

Questions frequently raised are what use is to be made of these lines and how are the lines to be made available to swine producers? In the first place the most important job is to develop

methods of improvement — that was and still is No. 1 on our list of objectives. At the same time, it is important that any useful stock we develop should find its way out to Minnesota farmers. An entirely new problem is hereby raised and its final solution will call for co-operation from the swine breeders of Minnesota.

Borax Controls Flies

The most effective way to keep down the number of flies is by control of breeding places. The female fly lays 100 to 150 eggs at a time, preferably just beneath the surface in a manure pile. The eggs hatch the next day, the maggots feed on decaying organic matter.

Many farmers find it difficult to eradicate all manure piles in summer. They lack the time to haul and they may lack fields on which to scatter the manure. Scientists at Vermont Experiment Station have demonstrated that if dry boric acid is spread in dairy barn gutters at the rate of 2½ pounds for each ton of manure, the fly population will be greatly reduced. Where 5 pounds is used per ton of manure, hatching virtually is eliminated.

Equal piles of manure were left exposed to flies for 6 days, then were covered with flytraps so that the flies hatching could be counted. In 2 tests 6,458 flies were caught from untreated manure, 610 from that treated at the rate of 2½ pounds a ton and only 18 from that treated with 5 pounds a ton.

—*Capper's Farmer*

Feeding Tricks

Condensed from Everybodys Poultry Magazine

G. T. Klein

FEEDING methods, if you know how to play the cards, can work like magic. Methods alone can keep cockerels from fighting, hold pullets back in their laying, do away with that pasting up in chicks, save one-fourth of the feed cost of raising a pullet, keep breeding males in good flesh, regulate production of layers, and control the fleshing of broilers and turkeys.

Dr. O. B. Kent called to our attention the advantages of "restricted feeding" of growing stock. Poultrymen worked with the method, made changes here and there to meet conditions, and took from it ideas that have been very valuable.

Pullets at the Massachusetts State College farm that went to range at eight weeks were given mash and oats in hoppers up to 9:00 a.m. They had no feed from that time until late afternoon when they were given a 15-minute feeding of whole corn and wheat, fed on the ground. During the day they had what could be obtained from a *good pasture* of bluegrass and Ladino clover. Sunday was a day of fast, and they had no feed except what the range provided. This feeding continued until housing time in the fall when all birds went on regular feeding.

Rhode Island Red pullets on restricted feed were checked against those having free choice of grain and mash. Feed consumption was 39 per cent less, whole body weight was about one-half pound lower than pullets on full feed. Maturity or age of first egg was delayed about 15 days. The restricted birds made full use of the range, grazing it uniformly. Few bare spots developed.

There was little difference in the production of the restricted and full-fed pullets. Neither did the restricted pullets eat more feed when housed as might have been expected. Eventually, they gained in weight equaling those on normal feeding. There was little difference in mortality, either on range or in the house.

There is no labor to be saved by restricted feeding unless grain and pellets are the only feeds used. Oats could be scattered on the ground in the morning in

Reprinted by permission from Everybodys Poultry Magazine, Hanover, Pa., June, 1944

quantities that would last until about 9:00 a.m. A 5-minute feeding of all-mash growing pellets could be fed in the afternoon scattered on the ground. This gives all birds an equal chance to eat, and a 5-minute feeding is enough to give them about all they want. Both the morning and evening feeding can be done from a truck. No feeders would be needed on the range with this method, and there would possibly be some saving in labor.

Restricted feeding is followed to some extent by the poultrymen of Massachusetts. Saving of feed and flock health are primary considerations, though few attempt to go the limit in feed saving. A 10 to 15 per cent saving is likely to be an average.

The delay in time of laying is a very great advantage with the January and February hatched pullets. Here is the greatest use that is made of the system for these birds start laying with larger egg size. Delayed laying is not desirable with many of the hatches, particularly April and May birds. It is an individual problem to be used as conditions warrant.

It may seem like an untrue claim to say that hungry cockerels do less fighting. It is true, nevertheless. Much of the slaughter of breeding males occurs around the feed hoppers and in shelter houses and brooder houses. This does not occur when males are hungry and have to forage for grass and bugs much of the day.

The system of feeding oats on the ground in the early morning and a 5-minute feeding of all-mash pellets in the late afternoon will save most of the cockerels. It should be used where there is a good range and it also helps if there are some rank growing crops or brush land for protection of the weaker birds.

There are few states where poultrymen feed more oats than in Massachusetts. Chicks six weeks old will start eating them, gradually gaining in their consumption until one-third or more of the diet is this excellent grain. Most of our flocks have oats before them the remainder of their lives, with no restrictions on the amount they eat.

Some poultrymen hold oat consumption of breeders to one-fourth of the total ration because they feel that vitamins are lacking if breeders do not eat about 50 per cent mash. Oats are important as a source of minerals and fiber and have very definite anti-cannibalistic properties.

Bowel trouble and pasting up in chicks is a digestive trouble that feeding methods can very largely prevent. That pasting up which comes when chicks are chilled or get too warm is almost entirely eliminated by going back

to that old time method of starting chicks on chick-size grain. It is fed for three days, and then they go on starter mash.

Chicks are fed grain along with grit on papers for three days. It is best to feed it five times a day in quantities that will be eaten before next feeding. It has a disadvantage for one such as a broiler grower who wants extremely rapid growth. This method definitely gives slower growth. At eight weeks, chicks fed on this method do not weigh as much as mash started chicks.

As a compromise method, broiler growers feed grain until 3:00 p.m. and then give their chicks mash which is also fed on papers. This feeding schedule is repeated for two days, and then chicks go on starter mash. Broiler growers say this combination gives advantages of both methods of feeding.

There is a trick in feeding breeding males to keep them in good flesh and condition. Invariably, they are too proud to eat enough feed from the same feeders as the pullets and hens. Feeders that hang from posts or the wall of the pen too high for the females, but within reach of males give them access to feed that they will eat from time to time during the day. Breeding mash pellets are first choice, while corn is second.

Whether layers are fed equal parts of grain and mash, all-mash, or by the free-choice method makes practically no difference in production. All three are methods that can be used with about equal success, but the important points in getting high consumption are the little tricks that get hens to eat more feed whether it be grain or mash.

Some of these tricks are adding fresh mash to feeders daily, stirring the mash with the hands when going through the house, feeding wet mash or pellets, keeping a small feeder of mash on the roosts during the day for timid hens and using appetizing feeds like condensed milk. Even though feed is scarce, it still pays to feed layers all they can be induced to eat. It is through high feed consumption that economy of production comes.

Grass-Seed Fortunes for the Harvesting

Condensed from Successful Farming

Carlton Stoddard

LEGUME- and grass-seed storage bins are almost bare. Our seed bank is virtually the sod in the fields. If a serious drought strikes, or if an army of insects goes on the march, a catastrophe is in the making.

To determine for *Successful Farming* how serious the seed shortage really is, I questioned men in every corner of the seed territory — farmers, commercial seedsmen, Government officials, and manufacturers.

The net impression they gave me is that we have set a booby trap for ourselves in war food production by failing to save enough alfalfa, red clover, sweet clover, alsike, ladino clover, and grass seeds. One more year like the last one—43 per cent short of seed goals—and our foot will be in it.

C. R. Enlow, Chief Agronomist of the USDA Soil Conservation Service and head of the WFA Seed Production Committee, pointed out that less than one farmer in 10 habitually harvests these legume and grass seeds. Many are letting a fortune shatter and go to waste in the fields. "Three times as many farmers should cash in on the high seed prices this year," Enlow said.

The prospective shortage of seed could result in a national disaster, warns John W. Nicolson, chairman of the Government's Seed Task Force. Russia wanted 20 million pounds of alfalfa seed this year and Great Britain seven million pounds of red clover, but neither got a pound. A shipload of seed will grow more meat and milk for our allies than we could send them in a whole convoy, Nicolson declared.

Supplies of legume hay have been disappearing at an alarming rate, reports J. B. McNulty, University of Minnesota farm management specialist, from his vantage point of observation in the northern dairy country.

Government experts reached the statistical conclusion that most farmers could buy only 75 percent as much seed as they wanted to plant this year. More eloquent than statistics were the despairing reports of men like Art Zinke near Elm Grove, Wis-

Reprinted by permission from Successful Farming, August, 1944, Des Moines, Iowa

consin, whose wide search for seed netted only a few pounds of sample-grade red clover.

Recognizing the seed shortage as one of the major problems in farm production this year, Congress acted decisively to provide incentive payments on a poundage basis totaling $12,500,000. AAA was already offering $3.50 per acre bounty for seed harvesting.

This in addition to the fancy prevailing prices for seed could easily make it the best paying cash crop in 1944, with the least work expended in cultivating and soil preparation. To read a seed producer's ceiling prices, you would think it was candy instead of seed he was offering.

Several factors have set the stage for a humming seed harvest this year. One is the fact that many first cuttings of hay were made one to two weeks earlier, due to the growing realization that protein content is much higher during the fine-stemmed, early-bloom stage. This will give the second cutting a better chance to produce seed.

Another factor is the important discovery that honeybees can miraculously step up seed production when the hives are located within easy flying distance of legume fields during blossoming time. The honeybee, not the bumblebee as commonly believed, is now recognized as being mainly responsible for cross-pollination.

Iowa State College *tripled* sweet clover seed production by achieving complete cross-pollination with one or more hives per acre.

I found commercial beekeeping circles buzzing with the news coming out of Henry County, Ohio, that W. E. Dunham had raised alsike seed production to 20 bushels an acre, and red clover to 12 bushels, thru 100-percent pollination with a saturation of honeybees in his neighborhood.

I asked Kenneth Hawkins, nationally known bee expert and author, if this might lead to an alliance between beekeepers and farmers. Honey and beeswax may become mere by-products of a giant new crop-pollination industry, Hawkins predicted. He estimates the potential value of bees for carrying pollen to be far greater than the value of honey and beeswax combined. The agronomists and management specialists of dozens of colleges bear him out, and commercial interests are watching the development with intense interest.

Hundreds of Louisiana bee colonies trucked to northern orchards every year may be available for clover pollination later in the season.

A gradual reduction of seed yields over the last 25 years is

partially explained by the unnoticed disappearance of wild pollinating insects, according to James I. Hambleton, of the USDA Division of Bee Culture at Beltsville, Maryland. The only alternative appears to be the use of honeybees, he told me.

If you live within three or four miles of a commercial bee yard, some of the 80,000 odd bees per hive are almost certain to find your blossoming fields. This year you are urged to be on the lookout for heavy seed-setting and harvest extra acres.

Wild bees and other insects also stimulate pollination. For this reason, poisonous insecticides are ruinous to seed production.

Watch your thermometer during blossoming time. Honeybees won't fly when it drops below 57° F, but they are whirling dervishes on a hot, sunny day. This may solve the old mystery of why seed sets best in hot, dry weather.

Another widely reported observation is that older, thinning stands produce more seed. More air and sunshine around each plant is the answer, concludes the Nebraska Experiment Station. Alfalfa cultivated in rows or hills outproduced broadcast stands in the Nebraska seed-production tests.

Alfalfa seed setting can be detected in advance. Watch to see how many of the flower pistils are being "tripped" by bees, or released so they snap upward against the upright petal. If the blossoms shrivel and drop off without setting seed, alfalfa may still be cut for hay without sacrificing all the feed value.

With feed running short, many farmers have needed the hay or pasture and have thought seed harvesting was out of the question. This is a major reason for our being on the brink of seed bankruptcy.

Consider corn. An acre of corn cut for soiling or silage late this summer can easily produce four times the tonnage per acre of hay or pasture. Not so high in protein perhaps, yet one Minnesota farmer I know insists that his milk flow speeds up when he switches from ear-corn silage to earless silage put up at the siling stage.

Soybeans for hay are another out, offering correspondingly greater tonnage per acre than alfalfa or clover. Many farmers planted Sudan Grass or millet to pinch-hit for pastures which they planned to set aside for seed this year.

In a pinch, you can also save legume *straw* for feed. From J. B. R. Dickey, Pennsylvania State College agronomist, I heard the story of one farmer who saved his ladino clover straw after running it *twice* thru the thresher. In spite of the beating it took,

the straw still tested 18 percent protein! Cattle licked it up.

The first run thru the machine hulled out 36 pounds of ladino seed, the second run 31 pounds more. Over $100 worth of seed per acre, if properly certified!

Running the crop thru your combine twice may be an idea to bear in mind this year. Seed crops hard to hull can be picked up from the windrow a second time, or you can use your combine as a stationary thresher and run your hay thru twice from the barn or haystack.

More often the problem is not hard threshing but shattering, the other extreme. Most experienced operators start cutting the crop when only two-thirds to three-fourths of the seed pods are ripe, for this reason. The fewer handlings, the better. A long-slope windrower attachment on your mower eliminates raking, which often has threshing action on the seed. A canvas on your hayrack will make it seed tight if the crop must be handled with a pitchfork and hay loader.

The Nebraska Experiment Station found it paid to construct sheet metal seed pans and attach them to your binder, one underneath the packers and another underneath the gap between the platform canvas and elevator canvas.

Sweet clover seed shatters so easily that it can also be harvested with the homemade beaters which are popular in Nebraska. To construct a beater, you strip an old grain binder down to nothing but the running gear, reel, and platform. Reinforce the reel and gear it 4-to-1 with the bull wheel. A screen cage enclosing the platform catches the seed, which is whipped out by the speeded-up reel.

Equipping a corn binder to battle bushy sweet clover is an idea developed at Ohio State University by C. B. Richey. It's simple. Attach some strap iron extension dividers, projecting ahead of the gathering snouts to increase the width of cut about 12 inches. Bend the strap iron back on the grain wheel side, outside the wheel to serve as a guard. Fasten it to the frame with iron brackets, and you're set to make corn-sized bundles out of rank sweet clover.

I find still more converts to the idea of removing the knotter from your grain binder for windrowing sweet clover to be combined.

An idea from M. L. Armour, University of Minnesota agronomist, sounds sensible in territories where sweet clover ripens unevenly and grows so rank you can't do a thing with it. Try raising the cutter bar of your mower with wood or metal runners under either end so it can be used to clip sweet clover back in June, about nine inches high.

"A fortune could be made raising pure Sudan Grass for seed," observes L. E. Willoughby, Kansas State College crop specialist. Ted Wilkins, of Lorraine, Kansas, took him at his word and sold seed from 22 acres for $1700.

If you are playing for stakes that high, it might pay to equip your combine with a vertical sickle attachment. Sudan Grass and brome, too, can be topped from the shock like sorghum with a vertical sickle.

If your brome seed proves bulky and hard to handle with a seed drill, you can remove the awns by running it thru a hammermill at slow speed, 300 to 1,000 r.p.m.

Spreading any seed in thin layers and shoveling it over pays dividends in higher germination. Especially if it's full of green stems, heating and spoilage are the gremlins to watch out for. Storing in slim seed bags and upending frequently is an old idea, but worth remembering.

There is something to the theory of home-harvested seed being better acclimated than imported seed. Better even than most seed imported from other states. Alfalfa in Nebraska, to be certified, must have been grown from stands at least eight years old. Home-grown red clover seed in Ohio has consistently proved to be more winter resistant.

However, a timely warning comes from F. W. Kellogg, president of a large Wisconsin wholesale seed firm. Farmers are trading seed among themselves, pretty much oblivious to state seed laws. Kellogg urges that home-grown seed be sold to local dealers, who in turn ship it to reliable seed wholesalers for thorough processing. Seed resold to farmers then meets every requirement of the law.

"Weed infestations are spreading like cancer, due to seed poorly cleaned at home," Kellogg emphasized. "Contaminated seed is responsible for increasing the annual three-billion-dollar weed loss in this country."

The average $45 home fanning mill is useful in screening out coarse weed seeds or inert matter, but cannot remove the most stubborn weed seeds, according to Kellogg. His outlay of $100,000 for seed processing equipment indicates how elaborate a plant is required to do the job thoroughly.

However you plan to clean your seed, it may pay you to pull out around weed patches with your combine or binder. If you can raise the sickle high enough to miss the weeds, or even rogue the whole patch in advance, so much the better. Fanning mills and seed cleaning attachments for combines pay for themselves quickly, not only in seed crops but in grain. Minnesota kept tab on 13,000,000 bushels of flax mar-

keted in one year, and found that dockage totaled 11.3 percent. The dockage amounted to 950 carloads, and the freight bill for hauling this worthless trash and weed seed was $138,000! Better to have kept it at home and gotten a little good out of it as ground feed.

On the other hand, clean seed this year is hitting the high spots. Just look at the producer's ceilings allowed:

Alfalfa (Northern)	$35.00 cwt.
Alfalfa (Central)	32.00 cwt.
Red Clover	30.00 cwt.
Alsike Clover	27.00 cwt.
Sweet Clover	10.00 cwt.
Sudan Grass	6.00 cwt.*
Ladino Clover	1.50 lb*

*Support price, no ceiling.

Our annual carry-over of almost all crop seeds has been running so low that it raises the question of what would happen in the event of widespread crop failure. Missouri is launching a state-wide campaign to increase its reserves of seed, including grains.

Last year while late corn planting was still under way, I visited the largest hybrid seed-corn warehouse in the world. It was bare as Mother Hubbard's cupboard—sold out. If hybrid seed producers had been burned out by drought, there would have been no reserve whatever to fall back on for planting this spring.

A pioneer caravan of Mormons once kept their seed wheat under lock and key, even though hundreds in their midst were starving. It was save the seed or else.

Today we may be facing that same "or else."

Efficiency Solves His Labor Problems

Condensed from New Jersey Farm and Garden

Samuel H. Reck, Jr.

WHEN you've got your poultry plant organized so one man can feed 12,000 laying hens, adjust the windows and check the water fountains in a half hour, you're pretty sure that Mr. McNutt isn't going to come around criticizing you for wasting manpower.

On the Robert Schwab poultry farm at Mercerville, N. J., four men, two of them sixty-seven years old, and a high school boy who only works afternoons from four to six o'clock and week-ends during the school year, do all the work. And that includes taking care of the 12,000 layers, hatching and raising all their replacements, hauling and mixing fifteen tons of feed each week, grading and packing up to 8,500 eggs each day and all the other things that enter into running a poultry farm. They do it by saving unnecessary steps and labor whereever possible. They feed the hens, for example, without anyone having to carry a bucket of feed more than ten feet.

Five long one-story laying houses extend from the main service house. Each laying house is divided into ten sections, housing 220 or more birds. Down each house runs a carrier on an overhead track on which is carried all the feed and on which a manure cart also runs to carry out the droppings.

The work-day starts at seven o'clock with the mixing of the wet mash. As one man mixes the mash, two others go through the houses and feed it, pulling down the dry mash in the hoppers at the same time. On the return trip they gather up the empty buckets from which the scratch grain was fed the evening before. The rest of the morning is taken up with cleaning the dropping boards, taking care of the young stock and looking after other chores.

In the afternoon they load up the carriers with scratch grain, hang two buckets of grain in each section, and gather the eggs on the way back. From 2.30 to 6 o'clock they grade and pack the eggs and then make a final trip through the houses to throw out the scratch grain and put the houses in order for the night. Dry mash is kept before the hens in hoppers which have to be filled

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only once a week. Water is supplied by bubble-type fountains.

Manure hauling is simplified by a two-level arrangement at the lower end of each laying house which enables backing a truck in on the lower level. The manure carrier can then be run over the truck and dumped without any lifting on the part of the operator.

In spite of the fact that his manual training teacher in high school considered him pretty much of a failure, Schwab proved his ability as a carpenter by building his laying houses himself, one each year beginning thirteen years ago. The nests are an interesting feature of the houses. In front of each battery of nests runs a trough which is kept filled with litter. It is Schwab's observation that the hens generally take a walk on this litter before entering the nests. This tends to clean their feet and cuts down on the production of dirty eggs.

Despite the unfavorable egg-feed price ratio and the tight feed situation which have complicated the lives of egg producers during the last few months, Bob Schwab intends to maintain his production at full capacity, feeling that conditions will soon take a turn for the better and that the present surplus of eggs is likely to turn a shortage later on. Last month he had over 8,000 replacement pullets on hand.

Many of the "in-and-outers," Schwab observes, are going out of business this year, and he feels that this should help greatly in clearing up the fog of huge surpluses and low prices which have been so bothersome recently.

So far he has been able to keep on top of the feed situation, but only by his foresight in buying some extra corn from North Jersey last fall and storing it in cribs on his farm. His feed dealer had been rationing corn at the rate of one part of corn to three of other grains.

Poultry farms like Schwab's are the backbone of the poultry industry. Run efficiently and managed wisely they go on producing quality products and making money through good times and bad.

Agriculture in North Africa

Condensed from California Cultivator

Stewart Lockwood

DURING a recent trip across part of North Africa, I had a chance to see some rather interesting fragments of agriculture in this part of the world. Much of the land is rolling, leading up to fairly high mountains. The summers are hot and dry and the perennial plant growth is rather sparse, with the result that much of the land is used for grazing small bands of sheep, a great number of milk goats and a few herds of cattle. On one hill slope, between fifteen and twenty camels were herded by a half-grown boy.

Sheep here are rangier, longer-legged and thinner-bodied than Americans are used to seeing. So far as could be observed, the wool was both shorter and coarser than that supplied by breeds which are popular in the United States. While most of the animals had white wool, some were black or brown-faced with the dark area extending back to the shoulders and, in three instances, the colored wool completely covered the bodies as far back as the last ribs.

Very few sheep are docked but the long tail did not present as much of a handicap as it would with our longer-wooled breeds.

I understand that some cheese is made from sheep's milk.

On the whole, the goats are rather small but some are heavy milkers and, in a few instances, udders were protected by cloth bags suspended by a harness over the rump and loin. Various shades of brown predominated but the color ranged from light faun to black.

While only a few cattle were seen in the hills, as a rule they were in good flesh. More cattle were grazing near the valley floor where generalized farming is practiced. Most of them did not show characteristics of any breed with which I am familiar but some Holstein, Jersey and Brown Swiss blood seemed to be present in the valley cattle. Others were mouse gray with the typical horns, neck, back and long legs of the cattle of India, but without the hump. Bulls were more numerous than in America and apparently ranged with the herds.

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Average weight of the range cattle was much less than 1000 pounds. However, work oxen in cultivated fields were heavier. Yokes used on these oxen were lighter, less curved and seemingly less efficient than those used by American pioneers.

Many small flocks of chickens were kept by both native and European farmers. They were quite similar to light - bodied Brown Leghorns. It's a rather common sight to see an Arab en-route to market with the heads of two chickens sticking out of the top of a floppy, woven basket of palm leaves. Omelets in a local European restaurant sell at the rate of sixteen cents per egg.

Donkeys are ever present animals but I doubt if there are as many of them as goats. Much of the farm produce is carried on their backs. Chickens, hay, butchered meat, melons, pumpkins, firewood and threshed grain are all moved by donkey - back as well as by two-wheeled carts. Sometimes the owner rides an animal and occesionally one is seen carrying both produce and owner. Generally, the load is suspended from, or lashed on top of, a surprisingly large saddle made of rawhide and stuffed with straw. Large, double - coned, palm baskets are favored over single panniers. As a rule, the loads are more bulky than heavy but when carrying squash or large pumpkins, as well as the owner riding back of the saddle, the load is extremely heavy. Many of the donkeys are a trifle smaller and darker colored than the pack animals of the Rocky Mountains, but certainly they are just as sturdy.

One broad valley was given over to grape growing and general farming. The fields were irrigated and well cultivated. The houses were rather substantial, square, stucco - covered rock, or adobe, buildings with tile roofs. Farmyards were surrounded by high walls of the same material, or by a hedge of thorn acacia or high - growing prickly pear. In some instances, these hedges were about a rod wide and reinforced with dead branches of the same material.

Many of the Arabs in the hills live in brown stone or adobe houses, which are rather small from our point of view, but apparently sufficient for them. Others up in the high hills live in villages of white stucco, which stand out from mountain backdrops, beautiful to see in the evening sun. Still others live in the same type of tents that have been common to this part of the world since the time of Abraham.

Harvest of grapes was in progress in one irrigated valley. The fruit was of good quality and the vines were well kept. Wine grapes were thrown into a high-

wheeled cart drawn by three donkeys hitched tandem but, oddly enough, these were led by two oxen hitched abreast.

In one area, barley and wheat had been grown on the rolling hills. The crop had been harvested and some of the land plowed. Sheep and goats were grazing on the stubble and not much was wasted. Hay and straw were stacked in trim-appearing, long stacks, thatched over the top and shoulders with what appeared, at a distance, to be reeds and adobe clay.

Weeds are as much of a problem here as in other parts of the world. Camel's thorn is a pest in some places. In one area, farm workers were busy grubbing it out but the success of their efforts seems open to question. Spring cockle bur and a creeping mallow also take a toll, but one of the worst to deal with is a trunkless palm with only the fan leaves appearing above ground. Large patches of this thick - growing pest were encountered in a number of places.

Fruit trees include small plantings of almonds, peaches, figs, oranges and considerably larger orchards of olives, which also grow wild in the hills.

Feed Barn Fan

A ventilating fan in a large barn in Lenawee county, Michigan, in which Felix Witt fattens cattle is useful both summer and winter. In cold weather the fan removes damp air. It is reversed in summer to blow air into the barn. Cattle do not sweat as a means of holding down bodily temperature, so the breeze is not so useful to keep them cool, but it rids them of flies, and they line up in front of it for relief.

—*Capper's Farmer*

"The Precious Things of the Earth"

Condensed from New Jersey Agriculture

Firman E. Bear

THE earth, the air surrounding it, the rain falling on it, and the soil and water covering its surface are made up of ninety known elements and probably two more that have not yet been identified. The plants growing on the earth, and the animals consuming them, choose from these ninety-two elements those essential to their growth and reproduction, largely rejecting or discarding the others.

Plants and animals are found, on analysis, to differ greatly from the soil, water, and air on which they feed. The accompanying table reveals these differences.

Oxygen constitutes about fifty per cent of all known matter. In the earth as a whole, the oxygen is associated chiefly with silicon, aluminum, and iron, whereas in plants and animals it is largely tied fast to carbon, hydrogen, and nitrogen. Plants tend to accumulate potassium; animals collect more calcium and phosphorus.

In the analysis reported in the table, ouly nineteen elements are mentioned, but they make up 99.53 per cent of the earth. The burden of this article, however, is the remaining portion, labeled "all other elements." These constitute 0.47 per cent of the earth and but slightly larger percentages of plants and animals. The question is: What are the "other elements," and what part do they play in the nutrition of living things?

Because of their intrinsic value, one thinks immediately of such elements as gold, silver, platinum, and mercury. There is no evidence that any of these four precious metals is of nutritional use to plants and animals. But what of the other sixty-nine elements that are not included in the table and have not been mentioned so far?

Designed to promote plant growth, a finely pulverized mineral mixture known to contain some sixty-five elements, including traces of gold and silver, is available on the market. The use of this mixture in conjunction with lime and fertilizers is reported to have had notable effects on plants. Careful study indicates, however, that these effects can be credited largely, if

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not entirely, to a relatively small number of the constituent elements, of which boron, manganese, zinc, copper, and molybdenum are the best examples.

Following in the footsteps of Dr. John W. Shive, of the department of plant physiology at Rutgers, who has long been testing these "trace" elements, one at a time, on plants that are grown in pure quartz sand to which he applies carefully controlled nutrient solutions, the soils department is carrying the study of these elements over into the field. Even though a given trace element is known to be of value to plants, the question still remains as to whether it is needed in larger quantities than the soil is capable of supplying. Soil is a very complex substance, containing traces of all the elements in

Comparative Percentage Composition of the Earth, Plants, and Man

	The Earth*	Corn Plant	Man
Oxygen	50.02	44.57	65.00
Silicon	25.80	1.17	——
Aluminum	7.30	0.11	——
Iron	4.18	0.08	0.004
Calcium	3.22	0.20	1.50
Sodium	2.36	0.10	0.15
Potassium	2.28	0.92	0.35
Magnesium	2.08	0.18	0.05
Hydrogen	0.95	6.26	10.00
Titanium	0.43	——	——
Chlorine	0.20	0.14	0.15
Carbon	0.18	43.70	18.00
Phosphorus	0.11	0.18	1.00
Sulfur	0.11	0.17	0.25
Fluorine	0.10	——	——
Barium	0.08	——	——
Manganese	0.08	0.03	0.003
Nitrogen	0.03	1.46	3.00
Strontium	0.02	——	——
All other elements	0.47	0.73	0.543
	100.00	100.00	100.00

*The outer crust of the earth, including the water of the oceans, lakes, and rivers, and the surrounding atmosphere.

amounts that vary with the nature of the rock from which it was formed. We are now trying to determine whether or not New Jersey soils contain adequate boron, manganese, zinc, copper, and molybdenum.

So far as is known, the addition of only three of these five elements has been found useful in the farms of this State. A recently completed study of the boron problem indicates that about 12 per cent of our land is deficient in this element, especially for such crops as alfalfa, turnips, rutabagas, beets, celery, and cauliflower.

The remedy for boron deficiency is borax. It is believed that all fertilizers sold in New Jersey should contain about 5 pounds of borax per ton. For alfalfa and other crops having high boron requirements, the borax application will have to be heavier than for other crops; in fact, 20 pounds per acre is suggested. It is important that not more than 25 or 30 pounds be applied per acre in any case, and that the application be reduced to about 5 or 10 pounds per acre on very sandy soils or for such boron-sensitive crops as limas, snapbeans, soybeans, and sweet potatoes.

The need for copper is normally met by the blue vitriol in bordeaux mixture, which is used as a fungicide. In New Jersey peat soils, however, it is now standard practice to apply 20 to 50 pounds of additional copper sulfate per acre.

Manganese is normally needed only on soils that have been overlimed. The solubility of the soil manganese is greatly reduced when the pH is raised to 7 or higher, as may happen when one gets a little overenthusiastic in the use of lime. Most farmers err on the side of not using enough lime, but the occasional man who has applied more than he should may find it necessary to apply 100 to 200 pounds of manganese sulfate per acre.

Attention is now being paid to the possibility of obtaining increases in crop yields by the use of radioactive elements. The Federal Bureau of Plant Industry is interested in this problem and has requested our cooperation. Consequently we have arranged to apply finely pulverized uranium oxide to soils in preparation for planting table beets. It has been suggested that this radioactive material be added at the rate of 15 pounds per acre in conjunction with the fertilizer. Whether any worthwhile increase in yield will result from its use remains to be seen.

In chemistry, catalysts are highly important to certain reactions. Only mere traces are required, and the catalysts are not used up in the process, but they must be present, otherwise the

chemical reaction will not take place. It is possible that trace elements, such as copper, zinc, and manganese, and the radioactive element, uranium, act merely as catalysts to speed the processes that are essential to the growth of living things. The catalysts used in the factory are not the same as those required by plants, and a still different set may be needed by animals. Minute amounts of iodine and cobalt, for instance, are known to be required by animals, but whether these two elements are deficient in New Jersey soils and crops is not yet known.

Roosters Follow Hogs

When a flock of White Rock cockerels were 8 weeks old, Oliver Hillier moved them to a corner of a cornfield at the farm he operates in Mower county, Minnesota. When the corn was ripe enough to hog off, he ran 2 electric wires around the houses and feeders that served the cockerels and let the chickens follow the pigs to pick up shattered grains. The wires stopped the pigs, but not the roosters.

—*Capper's Farmer*

The Care and Feeding of Ladino

Condensed from Eastern States Cooperator

E. K. Walrath and C. W. Clemmer

LADINO clover is a comparatively new crop for many farmers and one of tremendous capacity when properly handled. It dare be neither neglected nor abused. To give so much in food value it must be given the opportunity to build and restore its reserves for survival and renewal through both adequate fertilization and frugal management.

It is tempting to pasture a luscious growth of Ladino when no more than two inches tall, but at that stage it should be allowed to stand unmolested. This crop has a remarkably rapid recovery if not grazed until six inches tall or taller and then given complete relief from grazing when eaten down to the two-inch stretch. That takes more courage than most farmers possess. Especially is this most important in late summer when native vegetation tends to mature or dry up. Close grazing (shorter than two inches) is most abusive in September and early October when Ladino should be permitted to become well established for the winter. Its reserves can only be created from the leaf surface which remains and sufficient time must be allowed for that leaf surface to function upon the plant food and moisture which is placed at its disposal.

When we think of fertilization of Ladino clover as we now do of alfalfa, we have largely solved the problem. Both crops make a very rapid renewal growth after cutting; both plants make high yields of the highest quality roughage. To make these rapid and large yields of dry matter so high in protein, calcium, and phosphorus, requires that there be an abundance of all necessary raw materials present for the plant to manufacture into a finished product for poultry and livestock food.

Second crop Ladino clover hay is nearly equal to a good grade of alfalfa leaf meal, according to studies reported in Maine Agricultural Experiment Station Bulletin 415. This is what such crops give as feeding value and what they take from the field in fertilizer nutrients:

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	Second Crop Ladino	Good Alfalfa Leaf Meal
% Dry Matter	94.2	91.9
% Protein	20.8	21.1
% Fat	3.4	2.8
% Fiber	22.1	16.1
% Ash	10.5	12.2
% Nitrogen	3.3	3.4
% Phosphoric Acid	.76	.51
% Potash	4.02	2.93
% Calcium	1.76	2.60

Quality of Crop	Excellent	Good	Poor
% Protein	22.0	17.2	19.6
% Fiber	22.0	22.4	18.8
% Fat	2.8	3.2	3.0
% Nitrogen	3.52	3.58	3.01
% Phosphoric Acid	.83	.90	.81
% Potash (K_2O)	3.42	2.61	1.68
% Calcium Oxide	1.06	1.06	1.18
% Magnesium Oxide	.66	.53	.66

The Ladino clover in two cuttings of the timothy-ladino hay in these Maine experiments yielded over two tons of hay per acre. This hay had a total protein content equal to a ton of 20 per cent dairy feed and took from the land phosphorus and potash equivalent to 160 pounds of 20 percent superphosphate and 270 pounds of 60 percent muriate of potash. It would take four bags of ammonium nitrate to equal the nitrogen in this Ladino hay. Such a high value crop justifies the use of good land and adequate feeding.

The results of samples from seedings of Eastern States Meadow Pasture Mixture C at Westbrook where the growth of second cutting Ladino was excellent, good and poor are given to also point out the high phosphorus and potash requirements of this crop.

These soils were well supplied with phosphorus, calcium, magnesium and organic matter, but were low in available potash. Note that the best Ladino had nearly twice as much potash as the poor growth.

Use of Lime: Ladino clover has a wide range in tolerance to soil acidity. The crop does well on the acid potato soils in Maine and the near alkaline limestone soils of Pennsylvania or Vermont. We have yet, however, to see a good long-lived stand on any soil that is low in exchangeable calcium regardless of the pH or intensity of acidity. A moderate use of 1000 to 1500 pounds of limestone, therefore, seems advisable on fields that have not been limed for several years. Better yet, have a check made on the soil calcium and other soil constituents by a soil test as far as possible in advance of seeding.

USE OF PHOSPHORIC ACID: Recommendations for fertilizing Ladino call for as much as six times the amount of phosphoric acid as the crops remove. This is necessary because of the very low efficiency of superphosphate in our highly leached, phosphorus poor, soils of the Northeast. These soils, especially those with much clay or silt, fix or make unavailable to the plant two-thirds or more of the phosphorus we apply. Even more is fixed and lost to the plant if the calcium is very low and the amount of active aluminum and iron are high. Reinforcing manure with superphosphate to lessen the contact of the soil with this phosphorus carrier is a desirable practice, especially before seeding. Phosphorus penetrates the soil very slowly and when superphosphate is mixed with manure, harrowed in or plowed down, it is thought that the phosphorus is kept available to the plant over a longer period. The shallow root system of Ladino and grasses seems to make more effective use of phosphorus used as an annual topdressing than do deeper-rooted crops.

USE OF POTASH: The use of potash is complicated by the fact that as we step up the rates of potash we decrease the amount of calcium in the plant. These two elements give a see-saw performance—when one is up, the other is down; and the animal needs calcium for milk and bone, but needs very little potash. There is a problem of how to use the high level of potash needed to produce large crops of Ladino and yet keep a high level of calcium in the plant. A slightly acid soil with a moderate supply of calcium and a good content of organic matter are conditions favorable to efficient utilization of potash. Good soil aeration to encourage a vigorous root system is helpful. Moderate annual applications of potash as a material or in mixtures is more likely to bring about a favorable balance of potash and lime in the crop, than very heavy applications made less frequently.

BORAX: Very little work has been done on the boron requirement of Ladino. The activities of the Eastern States Fertilizer Research Service to date has been to learn something of what satisfactory long-lived stands contain, as a base line for comparison later with conditions of less satisfactory growth. Under relatively high levels of fertility, the boron in Ladino equals that of normal alfalfa. With such rapid renewal growth, there is less reason to believe Ladino with a more shallow root system would not suffer from a deficiency of boron if alfalfa does; and a stunted growth, abnormal bloom and short life result.

USE OF MANURE: Experiments in Maine show that on soils with a good reserve of available potash, annual applications of 10 tons of stable manure reinforced with 300 pounds of superphosphate will maintain a satisfactory stand of Ladino over a long period. On soils badly depleted in potash more of this element may be needed than manure will furnish. This is more certain to occur if the liquid part of the manure has not been well conserved.

If manure is reinforced with superphosphate, chemical fertilizer may not be necessary or profitable. It is a good practice, however, to try a few drill rows with fertilizer in addition to observe if reinforced manure is enough. There seems to be a definite need and trend toward spreading the manure thinner over more acres and supplementing the manure with some fertilizer.

The poultryman for sanitary measures does not care to use hen manure on his ranges. Nowhere does Ladino do so well as on poultry ranges that are well stocked and managed, if heavy mineral fertilization is used. The vegetable grower and dairyman with grass sods should offer a market for the poultry manure and such sales finance considerable of the investment in fertilizer.

WHAT FERTILIZER AND HOW MUCH? Under wartime regulations the several experiment stations have been required to state the maximum amount of fertilizer that should be used for a given crop. These 1943-44 recommendations under conditions of a short supply of potash stress the importance of liberal mineral fertilization of legumes.

RECOMMENDATIONS FOR TOPDRESSING: For topdressing legume stands in New England, fertilizer equivalent ot 500 pounds of an 0-20-20 was recommended or from 250 to 300 pounds of muriate of potash. For mixed grasses and legumes, the equivalent of 400 pounds of 0-20-20 or 400 to 500 pounds 8-16-16 was recommended as the maximum rate.

For topdressing Ladino or alfalfa stands in Pennsylvania, either reinforced manure or up to 250 pounds of the 0-20-20 or 0-24-12 mixtures was recommended. Maryland and Delaware with the greater acreage of lighter soil recommended up to 450 and 500 pounds of 0-20-20 respectively.

SEEDINGS: For seeding of Ladino or alfalfa, Connecticut recommended either 10 or 12 tons of reinforced manure or 300 to 500 pounds of the 0-20-20. In the other New England states, 200 to 500 pounds of the 8-16-16 or equivalent was listed. For

Delaware, Maryland and Pennsylvania, for seeding legumes or for mixtures high in legumes, from 150 to 400 pounds of the 0-24-12, 0-20-20 and 5-20-10 or reinforced manure was recommended.

Since the fertilizer supply situation will be more nearly normal for the dairymen and poultrymen if they take advantage of the opportunities for fall use of fertilizer, these general suggestions for fertilization of Hay-Pasture Mixtures with Ladino or Alfalfa are made:

DELAWARE — MARYLAND — PENNSYLVANIA

	Medium to Heavy Soil or Moderate Fertility	Sandy Soil or Low Fertility	Acre Rate Pounds
Seedings	0-24-12	0-20-20	200-400 lbs.
	5-20-10	5-15-20	150-300 lbs.
Topdressing	0-24-12	0-20-20	200-500 lbs.
	0-20-20	5-15-20	200-500 lbs.

NEW ENGLAND

Seedings	0-20-20	5-15-20	300-500 lbs.
	0-10-20	0-10-20	300-500 lbs.
Topdressing	0-20-20	5-15-20	300-500 lbs.
	5-15-20	8-16-16	300-500 lbs.

Green Pastures

Condensed from The Shorthorn World

G. E. Day

IT has been demonstrated many times that pasturing represents the most economical method of producing beef. One might expect that a crop of such great importance as that which grows on our pasture fields, would receive every attention, and that an effort would be made to take advantage of its vast possibilities as a producer of cheap beef. Too often, however, an opposite course is pursued. The soil may be good, and the seed mixture well chosen, but once the field is seeded, it receives no further attention until it becomes necessary to plow the field again. Many people seem to think that land which is grazed retains all its fertility, and that the application of fertilizer to a pasture field would be a waste of time and money. They overlook the fact that in its increase of weight, an animal carries away with it essential elements of fertility, and that land which is grazed heavily decreases in productiveness year by year.

The British farmer has a keen appreciation of the importance of pasture. In spite of high rentals and high cost of fertilizer, his pasture fields are never neglected, every effort being made to maintain their productiveness. They receive just as much attention as his other fields. Farmyard manure and commercial fertilizers are used freely, and a chain harrow is employed to scatter the droppings of the animals, and to break up and distribute evenly any farmyard manure which may have been applied. But, someone may object to the cost of fertilizing pastures. It is true that it costs money, but it costs money to produce any farm crop, and surely a crop which is the most economical meat producer grown on the farm, is worthy of more attention than it commonly receives. The British farmer is not spending money on his pastures merely because it is customary to do so. He fertilizes them in order that they may help him in his grim struggle to pay high rents and taxes, and to meet all other demands upon his income. In other words, he knows from experience that he cannot afford to neglect his pastures.

During the past ten years, the

Reprinted by permission from The Shorthorn World, June 25, 1944, Mt. Morris, Ill.

Ontario Agricultural College, Guelph, has accomplished some excellent work in connection with the fertilization of pastures. In Southwestern Ontario there is a considerable area, approximately a million acres, devoted to the fattening of cattle on pasture. Within this area the College obtained control, on a co-operative basis, of a hundred acres of representative pasture land. The farm was divided into two fifty-acre fields, one field being fertilized, and the other retained as a check, without fertilizer. In April, 1933, the one field received an application of 4-12-6 fertilizer at the rate of 375 pounds per acre. In April, 1938, a second application of 4-12-6 fertilizer was made at the rate of 250 pounds per acre, and the following year, the field received an application of 200 pounds of 20 per cent superphosphate per acre. During the test, care was exercised not to over-stock either field, but to use enough cattle to keep each area about equally grazed.

No attempt will be made to give full details of results obtained in the experiment, but there are certain figures which appear important, and which are easy to understand. A summary follows:

1. The fertilized area carried 46.6 per cent more cattle than the unfertilized area during the first five years of the experiment, and 56.1 per cent more during the second five years, which indicates a continuous increase in carrying capacity due to the use of fertilizer.

2. Total ten-year gain in weight on fertilized area, 53,771 pounds.

3. Total ten-year gain in weight on unfertilized area, 34,772 lbs.

4. Increased gain in weight from fertilized area, 18,999 lbs.

5. The average price of finished cattle during the ten-year period was approximately 9 cents per pound; therefore, the value of the excess of beef from the fertilized area was $1,709.91.

6. The total cost of fertilizer was $725.

7. Thus, every dollar spent for fertilizer gave a return of nearly $2.36 in extra beef produced.

8. This year, 1944, the fertilized area is carrying at present 50 per cent more cattle than the check area, and is showing a much thicker sward.

The experiment affords food for thought, and shows that the fertilizing of pastures is really worth while. Of course, it would be a waste of money to apply fertilizers to old, weedy pastures. Such fields should be broken up and seeded afresh.

A common mistake in establishing a permanent pasture, is to use too little seed. This is false economy. In some cases, nearly fifty per cent of the soil surface is not covered with herbage, and

it is not difficult to understand how such a condition will reduce the efficiency of the pasture. There are two cardinal points to be observed in seeding for pasture: (1) Seed heavily, so that every square inch of the soil surface may do its part in supplying feed. (2) Include in the seed mixture forage plants which grow quickly after being eaten off, and which remain green during hot, dry weather.

Clipping Back Rape

Rape seeded for turkey pasture at the farm in Paulding county, Ohio, operated by Peter Kunz and Alma Kunz, is clipped with a mower if it becomes too high before the flock gets to it. The cutter bar is raised just high enough to spare the hearts of all stalks. New leaf growth comes out rapidly to provide plenty of green feed within a few days after clipping.

—*Capper's Farmer*

Fertilizing to Make Water Go Further

Condensed from Better Crops With Plant Food

R. E. Stephenson

Soil Scientist, Oregon State College, Corvallis, Oregon

AN average of 500 pounds of water, which must be sucked from the soil by the roots of plants, is required to produce a pound of growth (dry matter). The water needs of plants vary widely, however, perhaps from half of the above figure to two or three times the amount. This variation is in part a plant characteristic, and in part due to differences in soil fertility and other conditions.

Weather in the form of precipitation is not only important for providing water, but through the influence of temperature is an important factor in water usage. The U. S. Department of Agriculture in a three-year study found that during one cool season 23 per cent less water was used to make a unit of growth. As air gets warmer, more water can be held in the atmosphere; and when warm air is dry, the evaporation or transpiration from foliage is increased. The rate of transpiration is about in proportion to the saturation deficit existing in the atmosphere. Air at 70° F. that is saturated with moisture will be only 40 per cent saturated if the temperature is warmed to 100° F. The power of the dry air to pull water from the plant is more than doubled by this temperature change.

Cold air will hold but little water and exercises only a small pull on the transpiration stream even when dry. The same temperature change in warming 80° air will cause 20 times as great an increase in the moisture-holding capacity as in warming 10° below zero air. Therefore heavy precipitation occurs in hot climates. The tropical rain forests, which become an impenetrable jungle of growth, are the product of a hot climate and heavy precipitation.

Plant growth is rapid in a hot climate because temperature is an important factor that governs certain plant reactions. Growth is the result of chemical changes that are constantly occurring in the plant. Raw materials, water, carbon dioxide, and nutrients from the soil are made to combine chemically through nature's methods of forming new growth.

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A law of chemistry says that the rate of reaction about doubles for each 18° F. rise in temperature. This law holds for plant growth provided the necessary nutrients and moisture are present, and sunlight can act upon green foliage. Growth is more rapid with increased temperature until excessive heat or lack of moisture causes injury to the living plant tissue. The same temperature variations, however, affect the growth of different crops to a different degree, because of the variations in the optimum temperature for growth among various plants.

Normally nature supplies the moisture, air, warmth, light, and nutrients from the soil necessary for plants to thrive. Man has a limited control over moisture through drainage, irrigation, and moisture-conserving practices. He has control if he chooses to exercise his prerogative, over the supply of nutrients, by use of fertilizers, humus renewal, and soil-conserving methods. The improvement of the nutrient supply may be practiced in any area that is suitable for crop production.

Much attention recently has been directed toward this problem. Man cannot eliminate the dry spells except where irrigation water is available, but he can eliminate nutrient deficiencies and enable the plant to use its somewhat limited supply of moisture with greater efficiency. Well-nourished plants may survive a drouth with good yields, where nutrient shortage of even one essential element if severe enough can make it impossible to produce a harvest from the best-watered soil. Moisture and nutrients therefore assume equal significance, and to the extent of his capacity, man should modify both for better yields.

The importance of fertility in efficient water usage has been illustrated many times. A study on Nebraska soils of three grades of fertility, (poor, intermediate, and fertile), showed relative corn yields of 1.0, 1.6, and 2.4, respectively. Relative water usage for a pound of growth (dry matter) was 1.0, 1,2, and 1.4 respectively, or exactly the reverse of the order for yields. When manure was used to improve the soil, yields were in the ratio 1.0, 1.1, and 1.3 for the poor, intermediate, and fertile soils, and water usage for a unit of growth became nearly identical. Thus manuring the poor soil more than tripled the yield, reduced the water required for a unit of growth by more than a third, and water usage became as efficient on the poor as on the fertile soil.

Recently the Indiana Station showed the value of proper fertilization for carrying a corn crop successfully through moderate

drouth periods. Making up one nutrient deficiency may increase the yield, but largest yield naturally results when all deficiencies are corrected. In the dry year 1941 nitrogen alone on Vigo silt loam added five bushels to the harvest. Nitrogen, phosphorus, and potassium added more than 18 bushels, doubling the yield. The fertilizer supplied 72 pounds each of phosphoric acid and potash and 41 pounds of nitrogen per acre.

In areas of little rainfall, available nitrogen may be the outstanding soil deficiency. The Washington Station found that with the same moisture maintained in the soil and variable nitrates, the yield of wheat followed nitrates. With 100, 55, 46, and 28 parts per million of nitrate nitrogen in different soils, wheat yields were 45, 35, 32, and 20 bushels an acre respectively. Poor hilltop soils, depleted of humus and nitrogen, responded to nitrogen fertilizer with a 19-bushel increase, bringing the yield to 43 bushels an acre. Washington investigators found that moisture in the surface foot of soil in the fall governed the amount of nitrate to be found in the spring and the yield for the season. With 10.7 per cent moisture, there were 13.8 pounds of nitrate nitrogen an acre and a 20-bushel wheat yield. With 19 per cent moisture, there were 70.5 pounds of nitrate nitrogen and a 49-bushel yield of wheat, thus a close relationship between moisture, nitrate supply, and yield of crop.

In a dry country or during dry periods the reserve of moisture stored in the soil becomes important. The crop must draw from stored moisture to carry through the dry period. In eastern Washington with 21 inches annual rainfall, seven feet of wet soil were considered sufficient moisture to produce 50 bushels of wheat per acre if there were no nutrient shortages, or other inhibiting factors.

Eroded soils are usually more subject to drouth injury. Humus and nitrogen are naturally found mostly in the topsoil. When the good topsoil is eroded away, the principal source of nitrogen is lost. Extensive drying of the topsoil aggravates the nitrogen shortage still further, because nitrates are not produced in dry soil and the deep soil though moist contains so little humus that nitrification cannot be appreciable. In the corn belt eroded soil in a dry season results in "firing" or burning of the foliage, a characteristic symptom of nitrogen deficiency.

The Indiana Station prevented the firing of corn and added 28 bushels to the yield on sandy soil by plowing under fertilizer, supplying 80 pounds of nitrogen an

acre. The plowing under was important because it placed the fertilizer down where the soil was moist. Fertilizer placed in the dry topsoil would have little value unless rains supplied moisture to allow plant roots to function in absorbing the nutrient. "Plow-sole" application at the Indiana Station was still more effective than plowing under. This deep placement reduced fixation of phosphates and potash, as well as assured contact with moist earth. The plowsole placement of complete fertilizer sometimes added 10 to 20 bushels to the yield, compared to plowing under. An additional light application in the row helped when moisture conditions were favorable.

The importance of correcting all deficiencies is indicated by Indiana corn yields on Vigo silt loam. Fertilizer to supply 80 pounds of nitrogen broadcast and plowed under yielded 27 bushels, but 80 pounds each of nitrogen, phosphoric acid, and potash broadcast and plowed under yielded nearly 57 bushels an acre. The same fertilizer treatment using the plow-sole method of application yielded 69 bushels in a year when the growing season was described as extremely drouthy. These yield responses are sufficient evidence of the importance of soil fertility in increasing the efficiency of water usage by the growing crop in dry seasons.

In another study in Washington sulfur was the limiting nutrient supplied by the soil for alfalfa production. Without treatment the yield was 1½ tons an acre, but with 200 pounds of landplaster the yield became 4½ tons an acre, with similar moisture conditions in the soil in both cases. Oregon soil deficient in boron, in greenhouse studies, refused to respond to complete fertilization including sulfur. When the boron was supplied, the yields were about tripled. Moisture was controlled so that water was not a limiting factor in either case.

When moisture is very limited, as in dry farm areas, there is a nice balance between too much and too little fertility. Wheat after alfalfa in Washington yielded 38 bushels an acre. By spreading straw on the alfalfa before plowing so that some of the excess nitrogen from the alfalfa would be used in rotting the straw, the wheat yield was boosted to 42 bushels an acre. The excessive nitrogen under the alfalfa sod made too much wheat foliage and the limited moisture was dissipated in growing foliage to the extent that the yield of grain was cut; therefore a better yield was obtained with less available nitrogen. In another study, the reverse situation was apparent.

Wheat grown after wheat required 487 pounds of water to make a pound of growth, whereas wheat after clover, with more available nitrogen, required only 310 pounds of water for a pound of growth.

The limited precipitation which may produce satisfactory harvests when the soil is of excellent quality in both physical and chemical properties is sometimes surprising. An orchard area in eastern Oregon on good soil produces four to six tons of cherries an acre, and up to seven or eight tons on the very best soils, where the precipitation for the last 20 years averages only 12.7 inches, only 2.2 inches of which falls in the six months April to September inclusive. And there is never a complete failure in spite of years like 1935 with 6.9 inches and 1939 with 6.4 inches of precipitation. These were hard years but there was a crop, and without irrigation. Only because of the excellence of the soil are the trees still alive and productive.

But an adequacy of both moisture and fertility with favorable temperature conditions is necessary for maximum production. The Indiana Station estimates that 20 inches of water for the use of the crop would be sufficient to produce 100 bushels of corn an acre if all nutrient deficiencies in the soil and other inhibiting factors were eliminated. This estimate is equivalent to the production of a pound of growth (dry matter) with about 375 pounds of water, which is a reasonable figure.

Man can correct a water shortage by irrigation in some areas. He can modify temperature in a small way as is sometimes done in orchard heating. He may deepen the soil somewhat by drainage and improve it with crop rotations that include legumes for nitrogen and humus renewal. Anywhere that crops are grown it is possible with well-selected, properly placed fertilizers for him to correct all nutrient deficiencies. Thereby he can make a limited supply of moisture go further, or in the more favored areas enable an adequacy of both moisture and nutrients to yield the maximum harvest.

He Knew What He Was Doing

Condensed from American Poultry Journal

L. M. Klevay

J. S. CORPE, of Colfax, Ill., has farmed for a good many years but never paid much attention to chickens until the spring of 1942, when it occurred to him that perhaps he had been overlooking a good bet. Since Mr. Corpe doesn't do things by halves, he converted an old 36x40 ft. horse barn into a three-story hen house, but before converting the barn, he started a brood of baby chicks on the way to become his first real crop of pullets.

J. S. Corpe is an inquisitive fellow and one of the things he was curious about is whether he would make money on his chickens. In order to find out, he decided to keep very accurate records of costs so that he could base his decision on actual facts and figures, rather than impressions.

On June 4th, he started a brood of White Leghorn pullets for which he paid 26c each. The chicks did very well for him, and 5 months later almost to the day, Nov. 5th to be exact, he found the first egg. He put the pullets into the house on Nov. 13th. Elsewhere on this page will be found a table showing how Mr. Corpe kept his records from December, 1942, to August, 1943, and it certainly is one of the most complete sets of records. However, before these records were tabulated, he knew what was going on by keeping accurate records of feed and other costs. He found that it costs 74.8c to put a White Leghorn pullet into the laying house. This included the 26c chick price as well as feed and other costs.

A study of the record table will show that he started out in December with 344 pullets and finished 9 months later with 273 still in the house. The importance in rate of production is emphasized by the April and May production figures, when reduced to an average of 295 birds, the flock laid 585 dozen eggs, or 117 dozen more than during December. It is also interesting to note that the profit above feed per hen was 53c in April as against 30c in December. The difference in average prices received for eggs in December and April affects the profits, but high rate of production also helps to bring the profit margin up.

Incidentally, it might be well to point out that while egg prices are in general higher in Decem-

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ber than in April, Mr. Corpe received more for his eggs in April because he sold them to a hatchery for hatching eggs.

The value of keeping accurate records was quite forcibly demonstrated in the case of another lot of 180 hens on which separate records were kept. It was an early hatched flock of pullets that dropped the first egg Sept. 12th, did quite well through October, November, and December, slipped a little in January, but really slipped down in February to 26.9% production. The profit above feed per hen during that month was only 8⅓ cents. Two months later, during April, this same flock came back to 76% production and showed a profit of 43.7c per hen above feed costs. In other words, when the production tripled, the profits per hen were multiplied by 5 and that in spite of the fact that the average price of eggs was nearly a cent lower.

Mr. Corpe based all his records on the average hens per month and then added the profit per hen per month, getting a final figure of $3.62 profit per bird above feed at the end of 9 months. He also has this profit figure for the full year, although he did not tabulate the entire 12 months. For the full year, he made a profit of $4.22 above feed cost per hen.

This flock of Leghorns laid a total of 4,445 dozen of eggs in 9

Month	Average No. of Layers	Doz. of Eggs Laid	% Production	Average Price of Eggs Per Doz.	Total Value of Eggs	Feed Cost			Profit Above Feed			
						Total Feed Cost	Feed Cost Per 100 Hens Per Day	Feed Cost Per Doz. Eggs	Total Profit	Per Doz. Eggs	Per Hen	Total Profit Per Hen (Cumulative)
Dec.	344	468	53.4	34c	$ 159.12	54.13	0.480	0.116	104.99	0.224	0.304	0.304
Jan.	332	525	61.2	36c	188.90	59.26	0.535	0.112	129.64	0.248	0.390	0.694
Feb.	305	394	55.4	38c	150.06	60.06	0.661	0.152	90.00	0.228	0.295	0.989
Mar.	300	361	72.4	41c	230.70	62.73	0.628	0.112	167.97	0.299	0.560	1.549
April	295	585	79.0	40.2c	236.58	79.03	0.831	0.135	157.55	0.269	0.534	2.083
May	291	585	77.6	38.5c	224.71	84.26	0.894	0.144	140.45	0.241	0.482	2.565
June	285	476	67.4	34c	162.01	66.21	0.774	0.138	95.80	0.202	0.336	2.901
July	280	438	60.4	34.5c	151.11	51.48	0.593	0.117	99.63	0.227	0.356	3.257
Aug.	273	412	58.0	37c	152.44	52.52	0.627	0.127	99.92	0.243	0.363	3.620
Total		4445			$1655.63	569.68			1085.95			

months, or an average of 12.9 dozen based on the original 344 birds started; converting this to number of eggs, the average production based on the number of birds started was 135 eggs, but Mr. Corpe does not believe it is fair to divide the total egg production by the number of pullets started. He believes that it is unfair to expect the live birds to carry the burden of those that died or have been culled out for any reason whatsoever. That is why he figures on the average hen per month basis. If the monthly averages are added up, the average production per layer for the 9 month period was 176.6 eggs, which is a mighty fine record.

The management methods that were responsible for these good records are not sensational, but Mr. Corpe is just as thorough in taking care of the flock as he was in keeping records. He follows the deep litter system, building it up throughout the winter, has droppings pits and uses no lights to stimulate production. On the ground floor of his remodeled barn, he has a crushed limestone floor, a type being used by a number of poultry raisers in that area. He is inclined to the opinion that perhaps a layer of one inch of crushed limestone might be useful even on the second and third floors and thinks he will try it.

His feeding system can be considered quite standard. He keeps a good laying mash before the birds all the time and then feeds 12 lbs. of grain per 100 birds per day. This grain consists of oats, corn and wheat. In the morning he feeds a mixture of 5 parts of oats to 1 of wheat and in the evening a mixture consisting of 6 of corn and 1 of wheat. He feeds 6 lbs. of each mixture morning and night. Oyster shell, calcium carbonate, and hard granite grit are available at all times, as is water, of course, in fountains with float type valves to assure a constant supply.

Mr. Corpe is a firm believer in making each project carry itself; that's why he kept separate records on two different broods of chicks and that's also the reason why he keeps separate records on his broiler raising operations. In making each unit carry itself, he does not make allowance in the cost of pullets for profits on cockerels if straight run chicks are raised. He separates the sexes at 7 weeks, and from there on, cockerels and pullets are each on their own to show profit or loss on their own merits. He considers raising cockerels a meat project and argues that it is just as unfair to balance cockerel profits against the pullets as it would be to balance profits from hogs against the pullets.

What Is a Good Herd Average?

Condensed from The Ayrshire Digest

C. T. Conklin

ASK the question, 'What is a Good Herd Average?', and the chances are about '50-50' that an off-hand answer will be rather carelessly or perhaps confidently given, 'Oh, about 10,000 lbs.,' which carries with it in the Ayrshire world the implication of 400 lbs. of fat.

Should the same question be given in other breeds or to leaders in DHIA circles, it is not unlikely that many would offer the same answer, while others might consider the level of 400 lbs. entirely too conservative. All of which indicates that there has gradually developed in the minds of breeders, college professors, extension dairymen, agricultural editors and many others the idea that in order for a dairy herd to be recognized as an ideal of efficiency it must average 400 lbs. or over.

Right at this point we pause to raise the question: "Just what percentage of herds (grades or of any breed) can economically and repeatedly average 10,000 lbs. of 4% milk (or its equivalent in higher or lower testing milk on a twice-a-day milking schedule with the usual proportion of immature females in milk?"

At the risk of seeming to be out of step with the army of professional dairy leaders who are faithfully fighting the cause of higher herd averages, we believe that the percentage of such herds is and should be surprisingly conservative, particularly when they meet these five important qualifications:

(1) *Economically fed and managed.*
(2) *Economically culled.*
(3) *Year completed in condition to repeat record.*
(4) *Milked twice daily.*
(5) *Normal percentage of immature milking females maintained in herd.*

Although it is not necessary to defend these five qualifications, attention is directed to the fact that many of the widely publicized herd records of the past, regardless of breed, have not met all of the above requirements. In fact, a few of the touted records have met none of these qualifications. And there may be good reasons why they didn't, but the point remains that it is doubtful whether a herd average should be held up as an ideal for ambitious and well-meaning dairymen

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when one or more of these five points has not been met.

"Economic Feeding and Management," which is 'adequate but not wasteful,' should be the obvious standard of every breeder. To most breeders profitable production *must* be the objective and not heavy feeding for the primary purpose of making a high average. Since market conditions control to quite an extent the level at which cattle breeders can profitably feed there will probably continue to be more variation on this point than on any other qualification that may help to standardize herd averages. The ratio of feed consumption to milk production will probably continue to be the most variable factor in the evaluation of records, and no doubt the most difficult to measure.

"Economic Culling" shuns the wasteful culling or ruthless selling of younger cows of intrinsic merit for the express purpose of making a certain herd average. Such cows may have breeding and producing value which do not warrant their sale for the sole reason of raising the herd average. A herd average cannot be fully understood and appreciated until one knows the number of females that were "trimmed out" each year. The average breeder with a constructive program will find it necessary to annually remove about 20% of the older or less profitable members of his herd in order to make room for first calf heifers. Of course culling is always necessary and advisable, but the practice of selling good cows only because they are "on an off year" is quite another matter.

"Repeatability" of a record depends on the regularity with which the members of the herd breed together with sound feeding and management practices. The herd that completes a year with its cows in milk an average of over 315 days will usually pay with a smaller average the following year, when cows will milk fewer days and at the latter end of long lactations. Whether a herd repeats its performance the next year depends to quite an extent on whether the members promptly conceive and are ready to go to work again after ten months of production and two months of rest. Cows that do not breed regularly do not help to make consecutive herd records of merit. Furthermore, "repeatability" prevails where cows have not been over-worked. The ideal year's record should be at a level that can be repeated year after year, provided of course that the level is **profitable.**

Two milkings daily is simply an arbitrary standard for measuring records, adopted because it is the practice of the vast majority of dairymen and because a stand-

ard is necessary if comparisons are made. If the majority of breeders milked three times daily then the standard should be on a 3x basis, or two standards one for 2x herds and the other for 3x herds. The third milking (which may be economically justified), when practiced throughout the year adds an average of about 18% to the individual or herd record. According to factors which have stood the most rigorous criticism, a 2x record of 8500 lbs. of milk and 340 lbs. of fat becomes 10,030 lbs. of milk, 401 lbs. of fat on a three time basis. Much harm has been done in the past by not indicating the frequency of milking on each Herd Test or DHIA record. Most of the 400 lb. herd averages in all breeds have been made with at least part of the herd milked three times daily part of the time. Instead of failing to mention this point, it should have been emphasized so that breeders working on a strictly two-time schedule (as well as all others) would have better understood. It may be perfectly proper to milk three times daily, but all should understand that a 2x record at 8500 lbs. is equal to 10,030 lbs. on a 3x schedule; and that a 2x record at 10,000 lbs. is equal to 11,800 lbs. on a 3x schedule.

WHAT IT TAKES TO MAKE HERD AVERAGES

Here are typical examples of the make-up of herds of 15 head (40%, or 6 of which are immature, the other 9, mature cows) producing at various levels.

Herd Averages		70	60	55	50	45	40	35	30	25	Avg. of highest day's production each cow
10,000	9 Cows 5 yrs. and older	1	1	2	4	1	—	—	—	—	50 lbs.
	6 Heifers	—	—	—	1	2	2	1	—	—	
9,500	9 Cows 5 yrs. and older	—	1	2	3	2	1	—	—	—	47 lbs.
	6 Heifers	—	—	—	1	2	2	1	—	—	
9,000	9 Cows 5 yrs. and older	—	1	2	2	3	1	—	—	—	45 lbs.
	6 Heifers	—	—	—	1	1	2	1	1	—	
8,500	9 Cows 5 yrs. and older	—	—	1	2	3	3	—	—	—	42 lbs.
	6 Heifers	—	—	—	—	1	1	3	1	—	
8,000	9 Cows 5 yrs. and older	—	—	—	2	4	2	1	—	—	39⅔ lbs.
	6 Heifers	—	—	—	—	—	1	2	2	1	

NOTE — Herd averages may be quickly estimated by multiplying by 200 the average of the highest test day of each cow that will figure in the yearly average, and then averaging the group. For example, a herd of about 45 lb. cows makes an average yearly record of about 9,000 lbs.

Unusual conditions in the breeding schedules of members of the herd or differences in persistency may contribute to herd averages that will cause variation, but as a rule one may try this method and secure a rough estimate within 4% of the actual herd average.

The percentage of heifers in milk is important in evaluating herd averages. The average herd usually has from 30% to 50% immature milking females; about 20% of the herd is first calf heifers and about 20% second calf heifers. Their production will average about 15% below a similar number of mature cows. Assembled herds frequently produce higher than home-bred herds because of the heifers in the latter. The ideal herd average should be so established as to allow for the regular development of the required number of immature milking females, necessary to keep the herd to capacity.

How Good Is a 10,000-lb. Herd?

Keeping these five points in mind, just how good are the cows that make up a 10,000-lb. herd? On the average cows produce 14.3% of their ten months' lactation in the first month. This means that a 10,000-lb. cow makes 1430 lbs. in her best month and that she is usually *a* 50-lb. cow for at least a few days of her lactation. A few days' production at the flush season is no substitute for a carefully supervised lactation record. On the other hand, every dairyman recognizes the merit of a 50-lb. cow —the kind of a cow that fills the pail night and morning when she is fresh. So if cows could be standardized to produce at a certain fixed rate and a dairyman decided that he was going to operate a 20-cow herd on a 10,000 lb. basis he would simply put in his order for 20 fresh 50-lb. cows. Barring accident and other misfortunes, they should do the trick, provided they are properly handled. Not a bad lot of cows in anybody's barn! Of course it can't be done that way, but the point remains that it takes a solid row of 50-lb. cows on two milkings daily to make a 10,000-lb. herd average.

But that isn't all. Practically every breeder milks at least a few heifers, and for every 40-lb. two-year-old, there must be a 60-lb. cow (on two milkings daily) if the herd is to make 10,000 lbs. And for every 30-lb. two-year-old there must be two 60-lb. cows or one 70-lb. cow. Since the average herd has from 40% to 50% immature females in milk they make the problem of the 10,000-lb. average even greater. There just can't be any loafers or mediocre performers in the stanchions of a 10,000-lb. herd unless they are matched by an equal number of super-cows.

It's Harder to Make a Second Record

Obviously any herd that can repeat a 10,000-lb. average year after year on two milkings daily without 'wasteful culling' and with the usual percentage of im-

mature heifers, is a delicate organization. It must operate day after day through the entire year like a perfectly balanced machine. It cannot hold its steady, fast pace and experience sickness, injury, a sterile sire, short pastures, irregular milking periods, poor hay, foot-rot, or any of the dozens of afflictions that plague the most successful of dairymen. In other words, when a 10,000-lb. record is made by a herd that meets all of the five qualifications mentioned above, it has achieved a goal which careful investigation will show that but few can hope to attain. In fact, perhaps it is time that we began to ask ourselves whether the 10,000-lb. herd is really a practical objective.

The Make-up of 10,000-*lb. Herds*

In the files of the Ayrshire Breeders' Association are the detailed records of each individual cow, in each herd that has been on Herd Test. These are the 'case histories' from which herd averages may be reconstructed, showing how each cow and her past performance contributed to her herd record. At random the records of several breeding establishments have been selected and are presented herewith.

Since the Laneway herd, Taunton, Mass., average 10,029 lbs. of 4.19% milk and 420 lbs. of fat in the year that closed February 29, 1944, it presents an interesting picture of just how one 10,000-lb. herd was made up. The following is a report of the high-day's production of each member of the herd that figured in the herd average as caught by the tester with all milked twice daily.

Mature:	**1 cow**	**@**	**80 lbs.**
	1 cow	**@**	**70 lbs.**
	1 cow	**@**	**65 lbs.**
	2 cows	**@**	**60 lbs.**
	1 cow	**@**	**56 lbs.**
	1 cow	**@**	**52 lbs.**
	5 cows	**@**	**50 lbs.**
	1 cow	**@**	**48 lbs.**
	2 cows	**@**	**40 lbs.**
	1 cow	**@**	**35 lbs.**
	1 cow	**@**	**30 lbs.**
4-year-olds:	**2 heifers**	**@**	**48 lbs.**
3-year-olds:	**1 heifer**	**@**	**52 lbs.**
	3 heifers	**@**	**43 lbs.**
	1 heifer	**@**	**35 lbs.**
2-year-olds:	**1 heifer**	**@**	**35 lbs.**
	1 heifer	**@**	**31 lbs.**

Average 26 Females .... 48 lbs. on the highest test-day of each cow

It is interesting to note that 13 members of the herd produced 50 lbs. per day and over, and 13 were under 50 lbs., so that the herd just about "balanced" on the 50-lb. standard. Or if you are interested, the average milk recorded on the high test day of each member of the herd was 48 lbs. Note that nine or 35% of this herd was immature females.

Another 10,000-*lb. Herd*

Perhaps it may be less confusing to cite other cases of smaller herds. Malden Brook

Farm, West Boylston, Mass., made an average of 10,421 lbs. of milk. The herd of 11 head included six mature cows and five heifers, which could be classified as follows on the basis of the highest test-day's milk weights on a twice-a-day milking schedule:

Mature:	1 cow	@	58 lbs.
	3 cows	@	55 lbs.
	1 cow	@	52 lbs.
	1 cow	@	45 lbs.
3-year-olds:	1 heifer	@	48 lbs.
	1 heifer	@	42 lbs.
2-year-olds:	1 heifer	@	46 lbs.
	2 heifers	@	37 lbs.
Average 11 Females			**48 lbs. per day**

The ratio of heifers to cows in this herd (45% heifers) approximates the average of most breeding establishments. It is particularly interesting to note that there is not a single second-rate producer for age in this herd, and that the average is just 10,421 lbs. Five members of this herd were better than 50-pounders, while six were under. The average of the high test-days of the respective members of this herd was 48 lbs.

Note that Laneway and Malden Brook herds were divided equally as to those above and below 50 lbs. Laneway had the wider range of from 80 to 30 lbs. in its individual cows, while Malden Brook varied from 58 lbs. to 37 lbs., but the herds had about the same production above or below 50 lbs., and averaged quite similarly.

What Is a 9000-lb. Herd?

So much for examples of 10,000-lb. herds. Let us turn to the 9000-lb. division. An interesting example is the Hutchby & Cooper herd of Newark, N. Y., that recently completed a record of 9108 lbs. of milk and 369 lbs. of fat on 20 head. Only once in nine consecutive years has this herd been below 350 lbs. of fat. Here is a real demonstration in repeatability. Furthermore, only twice has this herd averaged over 314 days in milk and never over 323 days. A high rate of conception!

Very important is the point that of the twenty head, four were two-year olds (20%); five were three-year olds (25%); three were four-year olds (15.0%) making a total of 60.0% immature herd members, which is the largest percentage of heifers of any herd reviewed. How good were the members of this herd that made 9108 lbs. of milk?

This 9108 pound herd could have made a better average had the twenty pound three-year old, which was milking in the second year of her lactation, and the 26-lb. two-year old been taken out. It does not follow that it would have been economical to do so, but in this herd of 20

head, with its seven individuals doing well over 50 lbs. per day, a 9100-lb. average was made. The average of the high day of the 20 members of this herd was 47 lbs. of milk.

Mature:	2 cows	@	58 lbs.
	1 cow	@	56 lbs.
	1 cow	@	48 lbs.
	1 cow	@	47 lbs.
	1 cow	@	46 lbs.
	1 cow	@	45 lbs.
	1 cow	@	38 lbs.
4-year-olds:	1 heifer	@	58 lbs.
	2 heifers	@	53 lbs.
3-year-olds:	1 heifer	@	56 lbs.
	1 heifer	@	53 lbs.
	1 heifer	@	50 lbs.
	1 heifer	@	48 lbs.
	1 heifer	@	40 lbs.
	1 heifer	@	20 lbs.
2-year-olds:	1 heifer	@	50 lbs.
	1 heifer	@	38 lbs.
	1 heifer	@	26 lbs.

Average 20 Females .... 47 lbs. per day

What Kind of Cows Make 8500-*lb. Averages?*

A typical 8500-lb. herd average is that of G. Fred Williams of Hutchinson, Kan., whose herd made the actual average of 8591 lbs. of milk and 354 lbs. of fat with the very satisfactory mature equivalent of 8916 lbs. of milk and 367 lbs. of fat. At just what level did the tester catch the 15 members of this herd on their highest test day? Well, here's the story.

Mature:	1 cow	@	58 lbs.
	1 cow	@	56 lbs.
	1 cow	@	54 lbs.
	1 cow	@	52 lbs.
	3 cows	@	50 lbs.
	2 cows	@	39 lbs.
4-year-olds:	1 cow	@	56 lbs.
	1 cow	@	49 lbs.
3-year-olds:	1 heifer	@	33 lbs.
	1 heifer	@	30 lbs.
	1 heifer	@	20 lbs.
2-year-olds:	1 heifer	@	44 lbs.

Average 15 Females .... 45 lbs. per day

The average production of this herd was 45 lbs. on the high test day for each individual. Here's an 8500-lb. herd in which seven of the nine mature cows were in the 50-lb. class. A creditable group of heifers may be charged with pulling down the average. With one exception they did well, but still heifers do not average with cows. The only real disappointing heifer is a daughter of a well-known grand champion, but due to the fact that she did not promptly breed again the flush of her production was in the preceding year's record. This is no doubt a typical case in which breeders must decide whether to "take the rap" and keep a promising heifer in the herd or sell her and raise his herd average.

Analyzing 8000-*lb. Averages*

Let us look over the records of herds that are producing about 8000 lbs. of milk and see how they are made up. The first that attracts our attention is Bordens

of Springfield, whose 13 members average 8194 lbs. of 4.38% milk. Although such a record has not been considered particularly impressive, upon analysis we find that 11 of the 13 members of the herd are immature and that even though the actual record is 8194 lbs., the mature equivalent is 9023 lbs. This is a case that demonstrates that without mature equivalents it is practically impossible to fairly rate herds.

The individuals in this herd produced as follows:

Mature:	1 cow	@	49 lbs.
	1 cow	@	48 lbs.
4-year-olds:	2 heifers	@	50 lbs.
	1 heifer	@	40 lbs.
	1 heifer	@	37 lbs.
3-year-olds:	1 heifer	@	49 lbs.
	1 heifer	@	43 lbs.
	1 heifer	@	37 lbs.
2-year-olds:	1 heifer	@	32 lbs.
	1 heifer	@	30 lbs.
	1 heifer	@	27 lbs.
	1 heifer	@	26 lbs.

Average 13 Females .... 40 lbs. per day

In this herd record are two typical examples of just what may happen with any breeder. One of these heifers had not conceived promptly and had been in production 485 days at the close of her Herd Test year. Obviously, the flush of her lactation was in the previous year's record. Another heifer had suffered a bruised quarter. Thus are the 27-lb. and 26-lb. heifers explained. Taking them out of the average would have made a considerable difference. The average of the high test-day of each member of this herd was 40 lbs. In this and other herds is evidence that a herd of 40-lb. cows and heifers is good for 8000 lbs. of milk.

The 9000-lb. Objective

With these facts concerning the level of production of the individuals in several typical herds (which are not unlike hundreds of other herd records on file in the Association's office) does it not seem proper to establish the point that for a vast majority of really constructive breeders, a 9000-lb. herd average is a very commendable objective? In fact 8500 lbs. may be a sound objective under certain economic conditions. These suggestions are made not with the idea in mind of attempting to justify a lower standard of production, but because it is hoped that sound objectives will lead to more profitable management and that the 9000-lb. level over a period of years has been demonstrated to be the more profitable for all except a minority group of very superior herds. It is also believed that first calf heifers may be more successfully managed and that valuable breeding cattle may be conserved longer with such ideals in mind.

Supreme Achievements

As for the 10,000-lb. herd average, it is not only still a glorious achievement for any breeder, but it will also enjoy the respect of still a greater number when the problems of attaining it are fully appreciated by all. As for the 11,000-lb. to 13,000-lb. herds, there is no question but that they should represent the ultimate in practical and efficient dairying, when they can be achieved on a 2x milking schedule with the normal complement of heifers and with only the normal rate of herd depreciation.

Herd Standards Without Facts

It is not strange that in entirely too many instances an impractical standard for herd average was established by breeders and others without making the slightest effort to analyze the factors or component parts of a herd record. Our earliest knowledge of records was based on individual animals that were handled for maximum production.

Twenty years ago when dairy cattle breeders read only about the highest records of the highest producing cows, made under the most favorable conditions, most of them did not know the first principles of herd averages; and those who did know the facts were too busy taking care of their cattle to rush into print.

It is safe to say that few indeed were the Ayrshire breeders who were not surprised and deeply disappointed by their first Herd Test averages back in those memorable years 1925-28 when Herd Testing for purebreds was being established. So wide was the spread between the herd average and the records of individual class leaders of which they had read that they did not seem reconcilable.

Psychologically, there still is a tendency to measure herd averages by the standards of individual cows rather than to reverse the process and use a sound herd average as the basis for establishing standards for individuals. It is important that we bear in mind that had we begun our testing with herd averages, our point of view might be entirely different.

Bridging the Gap

No doubt our failure to critically analyze and appraise the value of herd averages in the past has been due to the fact that for a number of years leading herds on Herd Test were maintained under practically the same conditions as when they were in the Advanced Registry. Three-time a day milking schedules were followed, feeding methods and other management conditions were comparable to Advanced Registry. To add to the confusion of properly evaluating these records little attention was given to re-

porting the frequency of milking in the published Herd Test averages of various breeding establishments. As a consequence the herds that commanded the headlines were those that were usually maintained under the most favorable management conditions. No aspersions are cast on these herds and their records. They are in many instances the most productive herds of that period, but without qualifying their records standards for the rank and file were inflated.

Herd averages have been effective in stimulating interest in the Herd Test and thereby the improvement of the Ayrshire breed. However, a critical analysis of herd averages, and a proper appreciation of sound objectives should still further enhance the value of the Herd Test.

Test Leaves Instead of Soil?

Mineral analysis of leaves, rather than the soil, to determine fertilizer needs of fruit trees, is receiving a great deal of attention among horticulturists. The leaves may tell better than soil what food is needed.

Massachusetts Experiment Station workers have found a definite relationship between the amount of magnesium in the leaves of apple trees and leaf scorch severity.

The relationship of the various elements is also important. A magnesium deficiency seems to be worse if there is plenty of potash.

Although still in the experimental stage, this idea of leaf-testing to determine fertilizer needs suggests a periodic "chemical examination" of leaves in commercial orchards.

—Farm Journal

Daughters Are Key to Progeny Testing

Condensed from Poultry Tribune

G. T. Klein

Massachusetts State College

THE ONLY value that a breeding male or female can have in a flock is in the ability to transmit desirable characters to the chicks. These characters may be high egg production, large egg size, early feathering, resistance to paralysis, good market conformation, or a combination of these.

The progeny test includes a determination of the kind of offspring produced by breeding males and females. It is, in simple words, trying to find the birds in a flock that are able to transmit those things which put dollars in the pocket of the poultryman.

There is no other way of knowing these facts. You can't look at a male, study his beautiful color, body type or conformation and tell how many eggs his daughters will be able to produce. You can't even look at the ancestry of a bird and predict whether it will be a good breeder. Neither can you tell which hens, when mated to a male, will produce the best performing pullets. It is only through progeny testing, that these things can be determined.

Examine the records of the male and five of his mates from the breeding pen at Massachusetts State College shown in the diagram above. While it is true that the mother and grandmother of the male were better than average producing hens, his pedigree is no better than some other males which were worthless. Compare the daughters of male S626 with those of male S123, whose records follow.

Male S123

Dam's Record 251 eggs

Sire's Dam Record 265 eggs

Mated to

Hen T2374	Hen A2675	Hen T2119	Hen V2711
234 eggs	245 eggs	265 eggs	221 eggs
Daughters' Egg Record			
189	205	211	139
191	180	249	189
157	176	207	191
201	211	185	169
121	191	203	205
	179		

The mating of Male S123 and Hen T2119 is the only one that could be considered satisfactory. Even in this case, cockerels would

Reprinted by permission from the Poultry Tribune, Mt. Morris, Ill., February, 1944

not be desirable breeders except possibly in flock matings. How else except the progeny test could one know these facts?

BREEDING PEN

Massachusetts State College

Male S626

Dam's Record 257 eggs

Sire's Dam Record 263 eggs

Mated to

Hen T2351	Hen T2341	Hen T2787	Hen U226	Hen U2335
Eggs 320	Eggs 232	Eggs 253	Eggs 272	Eggs 230
		Daughters' Egg Record		
220	255	155	234	165
245	302	246	277	246
218	268	232	289	220
	230		197	199
	224		257	250
			257	250
			220	218
			223	
			157	
			213	
			217	
Avg. 227.7	Avg. 257.2	Avg. 211	Avg. 235.7	Avg. 224.4

Male S626 is a good sire. While it is true that a few daughters failed to reach the 200 egg mark, the average of daughters from all hens in the breeding pen was very satisfactory. A poultryman would be justified in selecting cockerels from Hen T2341 as his first choice birds. He would have reason to expect cockerels from this hen, full brothers of the pullets trapped, to give good producing offspring.

There is always the question about how to use these cockerels to best advantage. Some of them could go into breeding pens where they would be tested in the same way as their sire, S626. Others would go into choice matings with selected females.

It is not often a recommended policy that inbreeding be followed. It would, therefore, be best to look for another unrelated family where all of the females seemed to be giving good egg records. The cockerels would not be mated to their sisters or other very close relatives unless there were some special reasons for doing so.

The testing of males is very time consuming; yet it is the basis for genetic breeding work. If a poultryman is to make progress in breeding, he must have at least 10 or 12 breeding pens for reproducing from his proven birds previously tested and for testing new cockerels. The more cockerels he can test, the more rapid will be his breeding progress. We suggest that if there are 12 breeding pens that four of these be for the best males previously tested and eight be for testing cockerels by mating them to hens with good egg records. Poultrymen should not feel discouraged if 12 breeding pens cannot be used when first starting the breeding program. It is a goal toward which to work.

Dr. D. C. Warren, Kansas State College, has outlined a method of testing three males in each pen during the ordinary breeding season.

The first male is mated to 10 or 12 selected hens. He stays in the pen for three weeks and is then removed. For the following week there is no male in the pen.

Beginning with the fifth week, the hens are artificially inseminated from a new male that goes into the pen. Two or three days later, the hens are again inseminated and after that, the eggs are fertilized by matings of the male. No chicks need be discarded because at least 95 percent of them will be from the new male. The second male stays in the pen for three weeks and the procedure is repeated.

Trapnesting the hens and marking the eggs, as well as hatching them in pedigree baskets, boxes, or bags is necessary. The chicks must be wing banded so their identity will be certain.

Rebuilding American Elm

Hybridization is being used by Department of Agriculture researchers in rebuilding the American elm to make it immune to two arch-enemies — Dutch elm disease and phloem necrosis, *a* virus disease.

Breeders are crossing the American elm, the rock elm and the Siberian elm. Two of the new hybrids have shown particular promise, having survived three successive years of heavy inoculation with the Dutch elm disease at the Morristown, New Jersey, testing grounds. Researchers have tested about 35,000 American elms, out of which one has been found resistant to the disease.

The tests have been under way since 1934, and it will probably be a few more years before new varieties will be available.

—Farm Journal

Before You Buy a Farm

Condensed from Farm Journal and Farmer's Wife

True D. Morse

President of the Doane Agricultural Service, Inc., St. Louis

IF you are not born at the right time, it costs you extra to buy a farm.

Many enterprising young farmers who were born about 1910 to 1915 now are ready to buy farms —only to find a land boom under way.

If they had been born 10 years earlier—if they had been ready to buy farms 10 years ago—they could have bought land at the lowest prices in 25 years. Now that they have enough money for a down payment, and enough livestock and equipment paid for, they are asking, "Should we buy farms we have seen double in price in the past 10 years?"

They are thinking of older farmers they know—for example, George Hardwork, who bought a farm after World War I, in the last land boom. He was 35 then; at 50 he was foreclosed. Today, at 60, he is a tenant, with little on which to retire. He and his family have known nothing but hard work, with more than their share of heartache.

It's only natural that a young man asks himself, "Should I risk that fate when I'm 60?"

The answer is not easy, nor is it the same in every case.

Farm ownership has its advantages. The owner can "stay put," and can develop his business as he wishes. There is something truly soul-satisfying, too, about ownership of your own land.

But there is no disgrace in tenancy. Many of the most capable and prosperous farmers in the United States are tenants and intend to remain such. Some owners even rent their farms and become tenants on other land. In the most prosperous section of Iowa, two out of every three farmers are tenants.

More than 60 per cent of city people are tenants, and many of the largest businesses do not own the plants they occupy. Often it is good business for a farmer to rent—more profitable than to own the land being farmed. It is far better to be a prosperous tenant than a worried, debt-burdened owner.

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If, however, you do buy a farm, check these points:

1. INCOME. Will your investment in land give you a better return than other investments? In figuring this, use long-time average prices. A 15-year past period is usually a good base. In the Corn Belt, prices have averaged about 60 cents for corn, 32 cents for oats, 80 cents for wheat, and 90 cents for soybeans.

No one knows what prices will be in the future. Don't assume you are a prophet who can foretell what will happen—the most learned economists admit they can't do it. If history repeats itself, however, average prices for the next 15 years will be about the same as for the last 15. Most students believe that they will not be lower.

Some economists anticipate inflation and high prices, in which agriculture will participate to an unknown extent. However, see what has happened to hog and egg prices in the midst of war. Prices have held up as well as they have, only because of costly government support. Whenever there are surpluses, prices are likely to be lower.

In calculating your return, be sure to figure a crop system that will maintain full soil fertility. There is no sadder sight than that of a farmer trying to pay for his land by mining the soil.

Here is an example of how to figure the return, based on a 160-acre Corn Belt farm:

	Acres	Yield	Price	Share	Income
Corn	60	40 bu.	.60	1/2	$720
Soybeans	30	18 bu.	.80	2/5	173
Clover	30	Cash rent, $4 per A.			120
Pasture	35	Cash rent, $2 per A.			70
Lots	5	Buildings, roads, etc.			50
Total	160				$1133

Expenses — Figure the Costs a Landlord Has To Pay Out of the Foregoing:

Taxes	$160
Insurance	20
Maintenance and depreciation (building, fences, wells, etc.)	170
Soil maintenance, like erosion control, etc.	100
Crop expenses, shelling, combining, delivery and marketing	50
Management, cash costs	40
Total expenses	$540
Net (gross income less expenses)	$593

If you figure that this $593 should represent a 5 per cent return on your investment, the land is worth $11,860 or $74.12 per acre ($593 ÷ 5 = $118.60 × 100 = $11,860). If you figure your return should be higher, say 10 per cent, the land is worth only half as much.

If you have to pay more than $74.12 an acre, on the above basis, go slow unless you can afford to accept low returns on your money, or unless you are willing to own land regardless of cost.

The $593 is the landlord's

share, and hence all that the land will earn for you. Out of that must be paid mortgage interest and principal. Of course you can't figure the tenant's share as return on the land.

You will be well paid for the hours you spend with a 5-cent pencil figuring in advance just how sound the investment is that you are considering.

2. CASH. Unless you can pay one-half of the purchase price of the farm in cash, and still have enough money left to operate without borrowing, you probably should not buy land now. Fifty per cent down may seem high, but the risk of losing the farm is high at present prices than it was, say, in 1936.

Remember, cash reserves, safely invested, work for you by earning interest. As soon as you borrow money to buy a farm, you pay, instead of collect, interest. If inflation comes, the machinery, livestock and products of your farm, whether you be tenant or owner, will bring you increased values. A farmer need not buy land as a protection against inflation. (It is likely that farm product prices will increase in an inflation period faster than rent.)

3. DEBTS. This is the time (for most people, at least) to get out of debt instead of borrowing more money. If you owe any money—do not buy land now.

4. BUY GOOD LAND. "Cheap land" is generally too high-priced at best.

5. BUY IMPROVEMENTS, don't build them. It's cheaper. If you need buildings, select a farm that already has the main ones. Building costs are high and will go higher. But never give up soil fertility to get buildings! When necessary to choose, take the productive soils. They will earn the money necessary for buildings. It is expensive to rebuild poor soils into highly productive land, although it can sometimes be done.

6. LOCATION OF FARM AND QUALITY OF HOUSE. It may pay dairymen and those branches of agriculture selling at retail to buy location on a good road close to market. For many other farmers, however, these elements will not help pay interest and taxes. When buying location or home values, be sure you can afford them. Too many people buy a nice house on a highway, and assume the liability of poor land. Good soils will pay for a modern farm home. Unless you definitely can afford both—take first the productive land.

7. GET AN APPRAISAL by an independent, qualified, honest appraiser. It is always a good investment.

8. IF IN DOUBT, DON'T BUY. There always will be good land to rent, and thousands of farms for sale. Don't risk becoming another George Hardwork, who

with one unwise farm purchase saddled himself and his family with a lifetime of poor living conditions and never-ending struggle.

Land probably is the safest of all investments, when purchased at a conservative price. Farm ownership is a worthy ambition. But more important is to follow a sound program that leads to security in old age, with the opportunity to enjoy along the way those educational and cultural values that distinguish the best of American farm families.

Mightier Than the Mower

Condensed from Missouri Ruralist

IT is easy to lay the blame for weeds taking our grasslands to the season, or to bad luck. More often the real trouble is a declining soil fertility. There is more and more evidence that getting at this problem of fertility does more to keep grass weed-free than mowing or grazing or any other practices that might be remedies rather than preventives.

There is the experience of A. C. Chamberlain, Palmyra, Missouri, for example. He has only a very small area of his 80-acre farm devoted to permanent pasture, only four and one-half acres, but this year his field is carrying twenty-five head of mature dairy cattle for at least six weeks. This is pasture that is worthy of the name — not just an exercise lot. Very few weeds are in evidence, despite the fact that he has not clipped this pasture for more than two years.

"There's just too much growth of grass, bluegrass, sweet and red clover, and timothy, to leave any room for weeds," Mr. Chamberlain said.

Mr. Chamberlain is starting on his second five-year period of demonstrating the use of fertilizer, chiefly phosphate. The land also has been well limed. The lush permanent pasture mentioned was phosphated last fall, having been treated five years ago. Applications were about 250

Reprinted by permission from the Missouri Ruralist, July 8, 1944

pounds of 45 per cent phosphate each time. The fertilizer was put in with a drill, so deep that it took Mr. Chamberlain and his two husky boys to push up the drill lever.

Check-strips were left each time and the untreated areas have been easily found.

"Grass on the check-strips keeps getting better and better," reports Mr. Chamberlain, "because the cows use this part of the field for loafing and have given it a heavier coating of manure. After the first fertilizer was put on it was easy to see the line."

The experience on this farm was found typical of other Marion county users of phosphate on grass. In checking up on pasture fertilizer results this county was chosen not only because it is a typical bluegrass county of North Missouri, but also because of the numerous demonstrations that have been in progress there for several years.

Here under average farm conditions it is being demonstrated that weedy pastures are due more to lack of fertilizer than to any other factor. This bears out experimental results at Sanborn field, operated by the Missouri Experiment Station, showing heavy stands of brome sedge growing on timothy sod that had been untreated for years, while on a plot alongside that had been manured and limed no brome sedge could be found. Both areas were equally infested with the weed seed, with entirely opposite results.

Weeds are the first worry for the owner of permanent pasture; stretching out the grazing season probably comes next. The experience of W. P. Doolittle, Palmyra, with fertilized bluegrass is fully enlightening along this line.

"The check-strip in this permanent pasture is difficult to see—in mid-June—but early in the spring you could see it a quarter of a mile away. I would say that the fertilized grass was ten days to two weeks ahead of the untreated grass."

The permanent pasture, with a fine stand of bluegrass plus sweet clover, timothy, and white clover as thick as hair on a dog's back, is not heavily grazed during the summer, unless absolutely needed. This growth is saved until late fall or early winter.

Thus the grazing season is stretched both ways by Mr. Doolittle. Earlier grass in the spring, more of it to save for winter, has come as a result of two applications of 250 pounds each to the acre of 45 per cent superphosphate, one in 1936 and one in 1941.

Mr. Doolittle has about forty-six head of dairy cattle, including twenty mature cows. They graze on his two twelve-acre pastures

most every night during the summer, yet the grass makes abundant growth for winter.

Mightier than the mower, then, is the team of lime and phosphate for increasing the feed had from permanent pasture. Of course, the practice of clipping pastures still is a good one.

In recent years emphasis has been put on supplementary pastures on many farms, with permanent bluegrass sod losing favor. Perhaps there has been a fertility reason for this. The lime-phosphate program which has made so much headway in Missouri was begun chiefly on small grain rotations. The fertilizer was applied at the time of seeding fall grain and both the grain and the following legume benefited. The small grain-legume combination has provided many extra days of pasture.

Meanwhile, most pastures have received scant attention when the fertilizer was budgeted for the farm. Authorities pushing the lime-phosphate program were content with this situation, for they felt that the crop land which had been farmed the hardest deserved first call for the fertilizer.

Now on some farms the crop land has been built up to a higher degree of fertility than the pasture land. Bluegrass has been accused of not being worth the space it occupies. The experiences of Mr. Chamberlain and Mr. Doolittle and others clearly show that this is not at all true. Bluegrass still holds down an important post in the year-around pasture scheme. No other pasture crop will beat it during late spring, in May. No other pasture crop will provide as much "free" feed during winter months.

Dairymen who have left permanent grass out of their pasture plan have found by experience that they lost production thereby.

More and more interest is being shown over the state in applying fertilizer to grass. Folks getting AAA fertilizer have asked how they can best treat their pastures.

Recommendations of the Missouri College of Agriculture and Extension soils and crops specialists are simple as to ways and means. After liming, phosphate is most commonly needed by wornout pastures, but potash also is suggested. Nitrogen is best applied thru a legume crop, they believe. On badly depleted soils complete fertilizers with nitrogen as well as phosphate and potash are needed, especially until legumes are well established.

The kind of fertilizer to use depends on the natural fertility of the soil, the lime supply of the soil, the amount of legume growth in the pasture and the manure applications that have been made.

Where soils are badly depleted

of organic matter but well supplied with lime, it usually is advisable to put on complete fertilizers such as 4-12-2 or 4-12-8 ahead of seeding legumes. On soils not limed grass can be helped by drilling in a 4-10-16 or the new grade 8-8-8.

On darker soils well limed, superphosphate is about all that is needed. If badly depleted a complete fertilizer such as 4-12-4 can be used for the first application with phosphate used alone later.

The fertilizer needs to be worked in the soil. This usually can be done at 2 times each year, in the fall when fall rains have started and in late winter. The fall application probably is better for the new mineral nutrients have more time to react with the soil before being needed by the growing crop next season.

A good drill will cut the sod enough to get the fertilizer into the soil, but a disk may be used. Some good will come from surface applications, but if at all possible the fertilizer should be worked into the soil.

Water Spreading on Range Land

Condensed from The Cattleman

Wayne H. Miles

District Conservationist, Soil Conservation Service, Tucumcari, New Mexico

THE term "water spreading," a comparatively new word in the vocabulary of ranchers and conservationists in the West, is used to designate a wide variety of gully control and flood irrigation structures. The practice has found wide favor among ranchmen because it fills a long felt need for a practical method of gully control on range lands.

Water spreading may be defined briefly as the practice of diverting water from an intermittent stream channel or eroded land to an area where it is loosed upon native grassland to floor-irrigate the sod. When properly designed and carefully installed, spreaders control gully erosion and at the same time increase production of palatable grass.

Reduced to its simplest form, a spreader may consist of a single furrow or small ditch leading from a channel to an area not wetted in low flows. Some of the larger spreaders, on the other hand, are made up of rather complex combinations of large dams and dikes designed to flood a section or more.

Water spreading has proved to be very popular with ranchers. For about two months in the spring of 1943 almost the only green grass in Chapman Brothers 30,000 acre ranch south of Endee, N. Mex., was some 500 acres in a large water spreading system. This spreader did not run in 1943, but was flooded by a rain late in the fall of 1942, and the carry-over of soil moisture resulted in an excellent growth of grass.

Gullies cutting back from the side of Charco Draw in the J. A. Kinkead Ranch south of Montoya, New Mexico, threatened to ruin an especially productive grass flat. A spreader dike built parallel to the draw in 1940 has put a stop to the gullying, and the diverted water spreads over an old flood plain to grow more grass. Another spreader on this ranch protects a spring.

Shoestring type gullies leading out from the base of Circle S.

Reprinted by permission from The Cattleman, July, 1944

Mesa in the Myrl Jowell Ranch near Quay, New Mexico, caused livestock to travel extra distances to get the grass and barred the path to riders. Spreader dams built in 1942 control erosion and provide crossings.

These examples show some of the possibilities of the practice and illustrate why it is popular with ranchers.

General Considerations

The many factors which must be considered in order to arrive at a safe and economical design for spreader work makes it desirable for the rancher who plans this type of work to get technical guidance if available from the County Extension Agent, Soil Conservation Service technicians, or others having experience and training in this type of work.

During the last four years the Canadian River Soil Conservation District of Tucumcari, New Mexico, has co-operated with several ranchers in the layout and construction of both large and small water spreading systems on some 7,100 acres of range land, as a part of well rounded conservation plans worked out with individual operators.

The relationship between acres in the spreader system to acres in the drainage should be carefully considered. Care must be taken to avoid overdeveloping a large spreader area which does not have sufficient drainage above to provide adequate flow for spreading; or, on the other extreme, has too small a spreading area compared to the drainage, with the result that too much water running back into the drainage below the spreader causes erosion. A ratio of ten acres drainage to one acre of spreader area is considered a good average for the Canadian River District, with ratios of 5 to 1 and 25 to 1 being about the two extremes.

It must be kept in mind that most flows will be low flows, and that extensive spread must be obtained from them. There is often a tendency to design spreaders so that satisfactory spread is obtained only under maximum flow.

From the suggestions of local ranchers and from their own observations and study, Soil Conservation Service technicians assigned to the district have assisted the district board of supervisors in developing general guides and specifications for water spreading. These recommendations are based on local conditions, but are presented with the hope that they will provide some usable ideas to persons interested in this type of conservation work in other localities.

Care must be taken to see that overflow from the spreader returns to the channel with the minimum of cutting. In some

cases a stable natural channel is available. In other cases it may be necessary to return the water to the channel by vegetated or mechanical structures.

Sand spreading from seriously eroding channels is a problem which must be considered. Some light sanding or silting in the spreader area may be permissible, particularly if only relatively small areas are damaged. Construction of the diversion dam at a point where it will provide a silt storage reservoir is often important in preventing or delaying sanding of the spreader area. Where the problem appears to be serious, the first dam may be built at the lower of the two or more alternate sites with the expectation of later building at another site when the first dam becomes filled with sand and silt. Fencing the silt basin and part of the channel above diversion structures allows grass, weeds, willows, and other vegetation to start and this serves to screen out silt. The desilting effect of spreaders is excellent and may be used to advantage to protect retention structures, such as stock water dams and irrigation reservoirs.

An eye for picking points of diversion which will achieve the maximum of spreading with a minimum of structural work is essential to the man planning spreaders.

Some points meriting consideration are: 1. Locate, if possible, a site above a gully headcut, thus avoiding the construction of an expensive dam; 2. locate the diversion works as nearly as possible at the upper end of a favorable spreading area; 3. locate the structure at a narrow and shallow point in the drainage in order to reduce the size of the dam; 4. look for places where the banks of the channel below the point of diversion are higher than the surrounding grassland channels into which water can be diverted, thus avoiding the need for a dike or ditch; 6. try to choose a location where no channel has been formed, and where part of the water from extreme flows can be bypassed safely; 7. look for sites with safe and adequate spillways; 8. locate diversion dams just below a bend in a gully channel where possible to allow flood waters to jump the gully bank without changing direction of flow, as this ofter reduces strain on the structures; 9. look for sites where a cut spillway will reduce the size of dam required (one dam on the Canadian River District was reduced from 6,000 yds. to 3,500 yds. by this means.)

Combination type structures which serve as stock dams, road or stock trail crossings, or serve to protect springs as well as spreading water and controlling erosion are particularly popular.

The assistance of an engineer should be obtained if possible to design dams and to lay out dikes to the proper grade and height. The following design specifications which are in use on the Canadian River District are given as general guides to be followed if a qualified engineer is not available.

Large dams are constructed with the same slopes, crown and spillways as stock dams. Adequate spillway cross section pass high flood flows is very important. The cross section required should be determined by the size and type of watershed and should be based on the maximum storm to be expected once in 25 to 50 years. Two feet of extra dam height or freeboard is added above the required spillway depth as a factor of safety.

Size of diversion dikes and ditches is governed by the head to be handled and the area to be watered.

Dikes are designed at a grade which will cause water to flow slowly enough to prevent erosion. The following grades are recommended where there is a borrow ditch above the dike: Height of dike 1.0′, recommended grade 9″ per 100′; height 2′, grade 3½″; height 3′, grade 2″; height 4′, grade 1½″; height 5′, grade 1″. Where the borrow ditch is below the dike and there is a good grass sod above the dike, water may be allowed to flow faster in order to decrease the size of dike required. In this case the recommended grades given above are doubled in order to increase the speed of flow.

In many cases supplemental structures will be needed below the main diversion to keep water from concentrating. Construction of many of these structures can be delayed until after the spreader has functioned in order to see just what is needed. Graded dikes, ditches and furrows may be used to get a better spread where natural spreading below the diversion is not adequate.

Percolator structures of loose rock, brush, or wire have been widely used in other areas as supplemental structures but have not been used to any great extent in the Canadian River District because of the rather high labor outlay necessary for this type of construction.

Active gullying at the point of diversion often prevents the very desirable practice of diverting only part of the flow and allowing the rest to continue down the same channel. On supplemental structures, however, it is often possible to pick up only part of the flow. In this case, the diversion may be designed to carry only enough water to flood a given area instead of the entire flood flow of the channel. The head necessary for a given

area will vary but one second foot per acre; or one second foot for each two acres to be watered is a good average.

Economies of Control

A wide variety of structures may be used, and a wise choice is very important as the value of increased grass growth should in most cases offset the cost of construction. In some cases, however, protection of valuable property threatened by the gully or by deposition from the gully will justify more expensive structures.

It appears from observation of spreaders constructed to date that grass yields are doubled on the spreader area. This would indicate that the spreader cost may equal the value of the land in the spreader. In dry years spreaders often function and the feed produced in these cases is so valuable that costs in excess of the value of the land may be justified. Earth fill structures are usually cheaper than masonry or other type structures, and for this reason have been most commonly used.

It must be kept in mind that there will be some maintenance to the spreader system and that after a spreader has operated a few times that there are usually some refinements and supplemental structures needed to make the system operate to the best advantage. Allowance should be made for this additional expense in weighing benefits against cost of the spreader.

Before constructure starts, the site should be properly prepared in order to insure that the fill will bond properly with soil. Vertical or very steep banks should be cut down to a slope of 2 to 1, preferably 3 to 1. This slope should be cut to the very bottom of the original bank. Brush, weeds, and grass should be cleared off, and the site of the dam or dike should be plowed or ripped before the fill is started. A keyway should be dug to good material if the gully bottom is sandy. Where dams are high and soils are unstable, fills should be put in moist and given some compaction. The completed structure should have 10 per cent added height to allow for shrinkage.

The design of water spreading structures challenges the ingenuity of the rancher and the planning technician and is a good example of the old adage that two heads are better than one. The technician and the rancher working together can produce a much better layout than either could do alone. The best water spreaders aren't built to a pattern. They are built to fit the ground.

Secrets of Soil Organisms Are Slowly Yielding to Science

Condensed from Farm Research

Alvin W. Hofer

EVERY farmer knows that many interesting and important changes occur in soil. Many of these changes are chemical reactions which proceed spontaneously, and others are due to the action of bacteria. The study of the bacteria of the soil and the part played by each kind is as difficult as it is promising. For example, an ounce of fertile soil contains more bacteria than there are people in the City of New York. These perform many useful functions, most of which are not understood. To understand them, it is necessary to take each organism separately and study it in detail. Before this can be done, the scientist must know the organism well enough so that he recognizes it when he has it and can distinguish it from similar types. Some of the forms are so much alike that they are hard to tell apart and the scientist is in somewhat the position of a blind man trying to carry on a study of sheep when he may have a mixture of sheep and goats, some white and some black.

When an organism is definitely recognized and studied fully, it may be possible to utilize it more effectively in the soil, or to put it to work outside the soil. One example of the former is the legume bacteria. The addition of these organisms to soils where they are not naturally present has resulted in greatly increased yield and much improved quality of crops. An example of a soil organism put to good use outside the soil is penicillin.

Soil biologists have known for a long time that certain microorganisms have the power to restrict the growth of and to kill other organisms. Recently, it was learned that this action depends upon the production by these organisms of toxins by means of which they poison other organisms which would compete with them for food. Surprisingly, it was found that these toxins are not harmful to humans, altho they are powerful destroyers of bacteria. The one in greatest use, penicillin, promises to revolutionize the treatment of certain hitherto incurable diseases. Even with

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those diseases which are usually curable, penicillin overcomes the stubbornness of the organisms in difficult cases. This result is possible because of the ability of scientists to recognize the mold *Penicillium notatum* which produces penicillin and to utilize the organism for this purpose.

Sometimes even the preliminary studies which serve to distinguish bacteria from each other require years, and even then may not be successful. This report concerns a group of bacteria known as "*Azotobacter*" which has been extensively studied because it is found in field soils that are not acid, and because it is known to fix atmospheric nitrogen, a fertilizer element that has in the past been very expensive to buy. These organisms or group of organisms may fix nitrogen outside the legume nodule regardless of whether legumes are grown. Usually, the amount fixed is not large, and serves more or less to make up for the losses incurred by leaching. Yet, were it not for this action, the soil would lose fertility much faster than it does.

While a certain amount of this beneficial action is due to strange bacteria that live below the surface of the soil where they will not come into contact with air, for oxygen is poisonous to them, some is thought to be due to the *Azotobacter* group. This organism has been known since 1901, and has been widely studied. It is peculiar in that it is extremely variable in form. Other bacteria usually appear in a definite form. Some always occur as rods and are fairly easy to recognize, while others will always be spheres. When the spheres occur in bunches like grapes, they are called staphylococci; when they form in chains, they are called streptococci.

Azotobacter, on the other hand, may appear as a rod, or as a sphere, or even in other forms. It has been reported to occur as a big irregular mass like an amoeba. Yet, there are characteristics that make possible its recognition and definite distinction from most other bacteria. The difficulty comes when scientists try to distinguish one kind of *Azotobacter* from another, or even to decide how many kinds there are. In the insect world, a specimen may be examined with a magnifying glass and distinguished from other similar kinds promptly, but with A*zotobacter,* which is so changeable, even the microscope does not help greatly.

One of the important characteristics that is always determined when a new bacterium is discovered is the arrangement and number of the flagella or hair-like structures by which the organism swims around in the water. Here, again, with *Azoto-*

bacter, scientists were baffled. Despite the greatest care and the most persistent effort, it was not possible to tell much about these flagella. Usually, chemicals are applied to enlarge them by depositing stain on them in order to make them look larger. With *Azotobacter* the process did not give clear results, and scientists were uncertain whether the flagella arose practically anywhere on the cell surface of the rod forms that were examined, or whether all arose from the ends of the rods. Despite long and persistent work, the problem remained unsettled.

Then the electron microscope was developed. Instead of using a beam of light as in a regular microscope, this machine uses a stream of electrons and thus makes possible much greater magnification than that of the ordinary microscope. By its use, scientists can see infinitesimal things even smaller than bacteria. Whereas even the bacteria may have been somewhat difficult to see, now they can be examined in detail. With *Azotobacter,* it proved possible to see the flagella even without preliminary enlargement by means of chemicals. Whereas the bacteria are about 1/10,000 inch in length, the flagella have a thickness of about 1/1,000,000 inch. Yet, film exposed under the electron microscope shows the cell with its flagella quite clearly.

The flagella are extremely minute, very numerous, quite long, and attached all around the cell. Thus, in a relatively short time, this new technic made possible the solution of a problem on which scientists have worked for years.

With the definite, new knowledge now available on this point, further progress should be possible regarding the number of kinds of *Azotobacter* found in the soil. Sometime, it will be possible to know which of these kinds are useful in soil, under what condition they do their best work, and to recognize them more accurately if they should ever be used for other purposes. Certainly, they cannot be used most effectively as long as there is a question as to how many kinds there are or until a means is found to tell the different kinds apart.

Roadside Stands

Condensed from New England Homestead

Blanche E. Pearson

WAR conditions have cut travel on many roads, but there's a surprising amount of essential use of autos. War workers, truckers, and officials are on the road.

Before Pearl Harbor we were just learning how to handle roadside stands.

A good roadside stand, run on correct principles, is a money maker if a volume of trade is built up. The writer made a survey just before the war, and there are Seven Basic Principles that at least help achieve success.

First, above everything else, the product sold is the standard upon which success is built. You can sell first-class eggs and garden products from an old, battered table beneath a tree—and people will come back and bring their friends with them. ...

But if you sell second-rate stuff, it makes no difference to the customer that he or she bought it in the cutest, prettiest stand in the United States. The housewife will turn thumbs down on a place that doesn't give good quality. So, above everything else, build up a reputation for quality in your farm products. It's the one foundation on which rest these other six points.

Second. Other things being equal, an attractive table, bench, or stand will attract the purchaser. Don't overdo the matter, and build an elaborate, Hollywoodish affair. Then the city folks will say, "Look, some man from the city has come out here and established a market. Let's drive on until we find a real farmer's place."

A small, neatly painted building with a few shrubs and flowers looks like stability and permanence. Many places have such a building, where products are kept in reserve, and a table, under a gay umbrella, is close to the road where it's easy to serve customers. This brings up the next point.

Third. If it's at all possible, locate the stand somewhere from 30 to 100 feet off the main road, so people can drive in and be out of the traffic. Right now this may not be a primary point, but as soon as conditions are normal, it will be vitally important. I asked, at a certain stand, some

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two dozen people why they liked to trade there. There were two answers that practically all the women gave. They said, "The products are always good, and it's a nice spot to get off the road."

The stand should have space in front of it for several cars to park. And by all means, surface the area so it won't be a morass of mud on a rainy day. A good covering of coarse gravel, harrowed in and rolled down, is an inexpensive treatment. Each spring spread a few loads thinly over the area, and it will keep the parking space decently clean for the customers.

Fourth. A "sales personality" helps keep customers returning. What is a "sales personality?" It means simply that the sales person is always friendly and courteous and ready to smile. Customers don't object to clean overalls! But one woman said, "I hate to buy from a woman in a dirty dress or a man who hasn't shaved for two or three days."

Fifth. With the exception of places that specialize in only one or two products, like an apple farm, or poultry farm, the most successful roadside stand businesses are those that carefully plan a long season business. I have been interested to read lately of various plans for one-family farming. One of the best examples of this, and an excellent plan for a roadside stand is a small farm located on a well-traveled road (but not a super highway) that has a list of products to sell which includes: asparagus, green peas, strawberries, raspberries, sweet corn, mellons, and winter squash.

If you'll study that list a minute, you'll see its advantages. It starts its sales early in May with asparagus. It has crops for sale through October. Second, every one of those crops is a specialty for which people are willing to pay a good price for a fancy product. And third, it means that the farm family doesn't have to work so hard from November through April. And the fourth practical reason is that it gives the family the month of April to set plants and prepare soil. Of course, each farm is an individual problem, but the above offers a practical workable plan for a family with a horse or small tractor for power. It should also be mentioned that such a plan almost demands the availability of water for the crops if one wants top quality as well as quantity in the crops. The writer's experiments indicate that over a succession of seasons availability of water increases the fruits at least one third, and in very dry years, it means the difference between a good crop and almost no crop at all.

Again, if you have a roadside

stand, you must keep it open at all times, or else advertise clearly the regular hours it will be open. It's very irritating to customers to drive to a farm and find the stand closed with a scrawled sign, "Open tomorrow." A stand is a store, and everything possible to build and maintain good will must be done.

Last of all, if you can continue to do some little extras, it will make for steady customers. Of course, a good product and a good measure come first. Nothing exceeds the drawing power of a heaping basket of fancy stuff. But beyond that, originality pays dividends. Some farm wives have certain favorite recipes printed, and give them to customers. One very successful stand used to give a couple of beautiful gladiolus blooms with a purchase of a dollar or more. And steady buying customers appreciate a little dividend now and then. What's that? Stores don't do it? Perhaps not. But they advertise. And the best advertising you can do includes little ideas like these.

If you are thinking of a roadside stand, you have to do the same things as any business does, whether you're talking about a great corporation or a corner drug store. You have to give service and quality and you have to advertise. That's the pattern for successful American business enterprise.

What Type of Feeding Will Pay?

Condensed from Capper's Farmer

George A. Montgomery

THE steers were crowding 950 pounds. They showed enough finish to bring around $15 on today's market. Paul Sadler, owner, Woodbury county, Iowa, had bought them in January weighing slightly over 500 pounds. He had carried them on alfalfa-clover hay and 4 or 5 pounds of grain daily until brome-legume pasture was ready. Then he had put them on grass with half a feed of grain until July 15, when they were brought to full feed. A month later Sadler was debating whether to sell or feed for more finish.

To that time each steer had consumed about 25 bushels of corn, or 350 pounds for each hundred-weight of beef produced. Much of the grain could be credited to pasture and roughage, but the cattle had eaten about all the cheap feed that could be marketed thru them economically.

That was August, 1941. The nation's cribs and bins were bulging with the biggest grain surplus in history. Extra feeding and later marketing seemed a good gamble. The cattle were high enough in quality to take more flesh advantageously when better finish commands a premium. Sadler held them; finally sold in October after each steer had consumed an additional 25 bushels of corn.

Any experienced feeder knows that corn requirements for each hundredweight of beef produced in the final finishing period probably was 3 to 4 times that needed earlier when hay and pasture supplied a large proportion of the nutrients. The cattle had passed the stage when feed is utilized most economically. Holding longer was justified only because each additional pound they put on would make all the other pounds worth more money.

A feeder can't afford to put on that extra finish now, for the feeding picture has changed drastically in 3 years. The grain surplus is gone. Pasture and hay acreage is down. The number of feed-consuming units has shot up and the Government has fixed beef ceilings at a level to discourage feeding to a grade better than GOOD. With similar cattle in his lot today, Sadler could hardly make a choice other than

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to sell. The extra feeding might easily wipe out profits accrued from the cheap gains already made.

Another point is worth noting here: He probably would not have cattle of that grade in his lots now; they were held too high last fall.

Cattle primarily are processing plants for turning coarse feeds into high quality human food. They cannot compete with the hog, the hen or the dairy cow as efficient converters of grain, but that does not mean they should not get corn. Since grain must supplement roughage and most pasture grasses to bring them up to the quality required to make good beef. Wallace Ogg, supervisor of a farm management association to which Sadler belongs, points out to members that no farmer has any business feeding cattle today unless he has some of these coarse feeds to market. Possessing these he should plan the beef project to tie in with the whole farm program so all crops grown will produce the maximum of needed foods. Use of 25 bushels of corn to put that last 120 pounds of finish on a steer is a waste of resources when the same grain can supplement bulkier feeds to put 300 to 400 pounds on thinner cattle or go into hogs to produce 350 pounds of pork.

The man who markets crops thru cattle today needs to know what to feed as well as how to feed it. As always, cattle must be bought right and sold at proper finish for grade if the project is to be a successful financial venture. Rex Beresford, Iowa extension animal husbandman, gives feeders the following 6 pointers: 1—Price is more important than feeder quality; you can't pay a premium for quality, because you can't get it back when you sell; 2—Feed older cattle rather than calves, because it is cheaper to buy pounds than put them on at present feed costs; 3—Feed for pounds instead of finish; 4—Keep costs down by making as many of these pounds as possible with grass and roughage; 5—Don't be afraid to feed enough grain to make roughage efficient for production of a good grade of army beef; 6—Sell when that grade is reached.

Ogg carried much the same program to members of his farm-management association. Albert Ramaker, Sioux county, Iowa, bought 30 Holstein steers that ranged from 800 to 1,280 pounds apiece between October 25 and November 5 at an average of $9.20 a hundredweight. He had them but 120 days, grained them only the last 60 days, got gains that averaged 2 pounds a head daily, and sold at $13.50 before lots got muddy in the spring. Spread was $4.30 a hundred, so

pounds he bought sold for $34.40 to $55.04 a steer more than they cost. He fed 420 bushels of corn, 40 tons of silage, less than 14 tons of hay. No protein supplement was used. At prices charged against cattle in Iowa State College tests last winter, the feed was worth $1,008.40. Gains made sold for $972, or $36.40 less than value of the feed. Profit was better than $32 to $52 a steer. Spread, not gains, made the money.

Roughage represented nearly 60 per cent of the value of marketable feeds used; grain a little more than 40 per cent. In addition, the cattle made a market for cornstalk pasture that supplied all the feed they got the first 30 days. The next 30 days they had only hay and silage.

It is interesting to figure Ramaker's feed costs in another way. The silage was from corn that made 60 bushels of grain, 14½ tons of silage an acre, so silage eaten by the steers contained 165 bushels of grain, making total corn consumption 585 bushels. Again using the Iowa State figures of $1.02 for corn and $20 for hay, these items eaten by the Ramaker cattle were worth $876.70, which is $131.70 less than the $1,008.40 total feed cost if silage is figured at the college figures of $7.50 a ton. Either $7.50 a ton is too high, or the roughage alone in each ton is worth $3.29. Regardless of what it is worth as a meat maker, it is feed that would have been unmarketable other than as stalk pasture if the corn had been husked and fed as grain. In a feeding test conducted by Ohio Experiment Station, half of a field of corn was fed as silage and the other half as corn-and-cob meal. Enough hay was fed with each to get maximum gains from the corn. Gain was 698 pounds for each acre of corn and hay fed to steers that ate their corn as silage. That is 58 per cent more gain an acre than the 452 pounds made by the cattle that ate dry corn. That is why Beresford advises cattle feeders to fill their silos, perhaps dig an extra trench and fill it, or cut a field for fodder.

Fodder was one item A. L. Luchsinger, Woodbury county, Iowa, marketed thru cattle last winter. He bought 38 common to medium steers that averaged 780 pounds at a cost of $9.50 a hundredweight, and put them on feed with 4 others he had raised. They went into stalk fields from December 5 to January 25, during which time they got a light feed of grain. From late January to mid-March they got ground fodder, corn-and-cob meal and ensilage. From then until they were sold around May 1, they ate low quality alfalfa hay and corn, but were on full feed only the last

30 days. They ate 23.8 bushels of corn apiece, gained 257 pounds a head, and sold at $13.25 to $13.65. They, too, were bought right, were fed according to their grade, and paid Luchsinger $2,394 for 1,000 bushels of corn, 3½ acres of silage and fodder, and a quantity of coarse alfalfa hay worth $15 a ton when good dairy hay is worth $25.

Luchsinger wasn't proud of his steers, some of which were Holsteins, Holstein crosses and peaked-rumped plain red steers; nor Ramaker of the black-and-whites he fed. Calves wouldn't have paid; they can't utilize cheap roughage to advantage. Both would have liked good-type beef steers at a safe price, but they couldn't be bought at a figure that would leave a profit when steer and feed costs were paid.

Difference in profit between good and plain cattle was illustrated in 2 cars of steers Beresford saw on the Sioux City market. Both lots had been fed about the same, were in approximately the same flesh and weighed about the same. The plain cattle had been bought at $10.10 a hundred; the good ones at $12.90, a difference of $2.80 a hundred. When they got to market fat, the good ones brought only 25 cents a hundred more—$14.60, compared to $14.35. If the feeder of the better steers had not run out of corn, he might have fed 2 months longer. Beresford figures cost of feed at 47 cents a steer daily, so the feeder would have had to get $15.50 for the steers to break even on 60 days more feeding.

Beresford has one more hint for the man who plans to feed this fall: Buy them thin; don't take any steer back to the farm if the packer will bid on him to kill. Just to keep the record straight with reference to his own views about cattle, Beresford adds this: "I want to make it clear that I am not against quality. It is only under present conditions — ceilings, feed supply, cost—that the feeder cannot afford to pay the usual premium for choice feeders."

The Self-Propelled Combine

Condensed from The Ohio Farmer

E. W. McMunn

WHEN the first lumbering combines made their appearance in Ohio grain fields most farmers were convinced that the ultimate in grain harvesting efficiency had been reached. Hadn't the binder and the thresher with its big crew of harvest hands been replaced by a machine which cut and threshed the grain all in one operation? And best of all, a farmer didn't have to call in all his neighbors to get the threshing done.

The coming of combines to Ohio farmers marked one of the big steps in increasing harvesting efficiency. But this year on a few Ohio farms is operating a new machine which goes even one step further in providing a specialized machine for the grain harvest and this is the self-propelled combine.

At harvest time J. B. Anderson of Madison County climbed upon the platform of his new self-propelled combine and made the first seven-foot swath across a flat field of rippling grain. No tractor was pulling this new machine, for the built-in motor supplied power for forward motion as well as to operate the combine itself.

Mr. Anderson was enthusiastic about the performance of this machine. He pointed out that since the machine has no tractor pulling it, there is never any grain mashed down in opening up a new field. The self-propelled combine cuts a swath wide enough to drive thru, and thus on even the first trip around the field is always operating on stubble ground.

The generally dry weather of this harvest season has permitted fields to ripen uniformly, but Anderson believes this machine will have an advantage in a wet season by permitting the field to be cut in any shape, taking out ripe spots while leaving wet areas until a later date.

This new self-propelled combine is mounted on three rubber tires, with the two large front wheels serving as drive wheels, while steering is provided by the small third wheel at the rear. All controls for the motor and combine are located at the platform directly above the machine

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where the driver sits. Since the operator is above the center of the swath being cut, he has an unobstructed view of the ground over which the machine is moving and is in a better position to observe any stones or other obstructions which might cause breakage.

A wide range of speeds are provided on this self-propelled machine and thus it is possible to maintain an even flow of grain to the cylinder by adjusting forward speed in proportion to the thickness of the grain stand. This machine was operating on the Anderson farm in the same field with a six-foot tractor-powered conventional combine, and Mr. Anderson estimated the self-propelled machine was almost a third faster.

While these small self-propelled machines are just now making their appearance in Ohio harvest fields, it is true that self-propelled machines of larger sizes have been used for several seasons further west in the heart of the Wheat Belt.

In fact, an important contribution to this year's harvest effort is being made by the Massey-Harris Harvest Brigade of 500 self-propelled combines which started out with the goal of harvesting one million acres of grain, and only recently boosted this goal to 1½ million acres. These machines, with 14-foot capacity, were sold to custom operators who agreed to use them for custom work where needed in the great Wheat Belt, starting in Texas and working north to the Canadian border. Each operator had originally pledged to cut 2000 acres of grain, but this has now been increased to 3000 acres.

Organized in cooperation with the War Food Administration, the Harvest Brigade was set up to aid in saving this year's bumper wheat crop and relieving some of the shortage of manpower and machinery. Some outstanding records have already been reported from the Texas-Oklahoma sector. These large machines are averaging as much as 50 acres a day. One operator harvested 446 acres of grain his first 11 days in the field. Many are working day and night.

Electric Fencing May Be a Great Economic Convenience or a Hazard

Condensed from Science for the Farmer

John E. Nicholas

ELECTRIC fencing is not new. Controllers were patented in 1882, 1886, and 1891, but this method of restraining livestock did not prove popular at that time, perhaps because so little was known about electricity.

Steel and labor, both critical wartime needs, are saved in the construction of electric fencing, but home-made controllers are not to be recommended. Commercial outfits, as a rule, now are dependable, a condition which was not true of early models. Manufacturers have been quick to note defects and remedy them.

The principles on which an electric fence operates may be outlined almost as simply as those of a wheelbarrow, but an electric fence controller is somewhat more difficult to build, since it must work continuously with very little attention. The wires furnish a channel through which electric impulses travel at definite intervals. These impulses give objects, such as animals, "shocks" if they come in contact with the wires and by so doing form a "ground." The control device of an electric fence measures and spaces the impulses and may gauge their strength.

Spacing and breaking the flow of current in the wires usually is accomplished in controllers by means of a pendulum or oscillating device which is the "heart" of the whole contrivance. Either direct or oscillating current may be used. When the pendulum swings forward and the circuit opens, the flow of electricity is suddenly cut off. Somewhat as with a fluid, water for instance, when the flow is suddenly cut off, pressure tends to build up at the point of stoppage, and in the case of electricity the voltage may rise to a point far above that normally carried in the wires. This concentration in the flow of current builds up magnetism in the breaker points until they swing the pendulum back and come together. When the circuit closes, the congestion of power is momentarily released, the magnetism of the points declines, and

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the pendulum is allowed to swing forward, again opening the circuit.

Therein lies the danger. If the fence is connected to a high line and the controller becomes damaged or sticks, the wires are a menace to the life of any living thing which they touch. For this reason, while it is a very useful instrument, an electric fence controller must be very delicately balanced.

They operate as well on wet or dry batteries as on high line current, and farmers often have felt secure against accidents when hooking-up their electric fences to current from such sources. The current build-up from a "hot shot" battery if a controller sticks with its points in partial contact may be enough to destroy life, experience has proved.

Electric fencing is a great convenience, but the rule that "It is better to be safe than sorry" fully applies in its use. Even factory-made units are subject to breakdown, and every controller should be inspected occasionally to make sure that it is working properly. Very often by listening to its operation, a hint may be obtained as to whether it is working smoothly or not.

Most failures of electric fence controllers result from three or four causes, laboratory tests of all commercial types and reconditioning of broken-down units show. The repairs most often needed are: solder end of hinge pin, free-up ball bearing, file points, or general adjustment, cleaning and oiling.

The nature of these repairs indicates why home-made controllers are likely to be unsatisfactory. Many farmers and their sons are good mechanics but building an electric fence controller is far too technical a job for them. Several units constructed in the College laboratory worked well for a time but all broke down eventually.

The simpler a device of this kind, the better. Current intensity control gadgets and similar frills have no place in their construction. Since the pin and bearing on which the oscillator swings and the contact points are the things which commonly give trouble, they are the parts which should be questioned regarding durability when an electric fence controller is purchased. A newly developed type of current interrupter may prove to be the most simple and satisfactory.

Electric fencing must be sturdily built to give good service. Corner posts must be substantially braced and all charged wires insulated at posts and at similar points of contact. Tall grass and weeds must be kept away from the wires or much current will be wasted and the usefulness of the fence impaired.

Although cattle, hogs and sheep have been satisfactorily kept within bounds with electric fences at the Station, need for a training pen for inexperienced animals has been demonstrated. Animals which never have come in contact with an electric fence before may charge through in panic the first time that they touch the charged wires. An easily constructed training pen near the barn was found simple to use.

The lightning arrester on an electric fence must be kept in good order. The "ground" must be buried deeply in moist earth to insure complete safety during thunderstorms. For the reason that the wires are attached to the posts with insulators, an electric fence with no lightning arrester is a much greater hazard than an ordinary fence which is grounded every rod or two by posts.

Pasture Poisoning

Condensed from Pennsylvania Farmer

J. B. R. Dickey

LOSSES of livestock on pasture total up to very serious proportions annually. From the standpoint of the individual stockman they are often disastrous. If one studies the literature on plants which may under certain circumstances be poisonous it is a wonder that losses are not far greater. Fortunately most dangerous weeds are so unpalatable that stock avoid them if plenty of other feed is available. Poisoning is much more common on wild, unimproved pastures. It is also more apt to occur early in the season when the weed is small and is eaten along with the grass in which it grows; or else after midsummer when pastures become poor and short and the animals are driven to sample anything. While it is impossible in many cases to eliminate all of the hazards it would at least be well for farmers to recognize them.

Wild Cherry is probably one of the most common causes of loss. The unwilted leaves are appar-

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ently not dangerous, but let a tree or a branch blow down and the leaves wilt somewhat and a deadly poison known as prussic or hydrocyanic acid is formed. This is the same thing which may make sorghum poisonous after frosting. Cows seem to relish these wilted leaves and eating them is often quickly fatal. The fallen blossoms of wild cherry are also reported to be high in prussic acid. Wild and choke cherries are very common around the fence rows. They should never be cut while stock are in the area and an inspection for fallen limbs and trees after any serious wind storm may prevent losses.

Water Hemlock occurs frequently in pastures all over Pennsylvania. It is most apt to grow on moist land and along fence rows but seems to thrive anywhere. The root is perennial and somewhat resembles that of a small dahlia. The hollow stem is branched and generally four or five feet tall. It bears flat, terminal clusters of small white flowers, somewhat resembling those of a wild carrot, which come out in June. The rather sparse leaves are a little like those of a parsnip but finer. The plant should not be confused with the wild parsnip which has yellow flowers and is apparently harmless.

Poison Hemlock is much larger than the above and is usually found in wet places. It has a heavy, hollow stem, a parsnip like root and fine leaves resembling parsley. It also has white blossoms in flat clusters. Both of the hemlocks have a strong, characteristic odor when crushed, and both of them are very poisonous in all their parts. Stock are most apt to eat the low, new growth of the hemlocks along with the grass. Cutting them off simply promotes more of this growth. They should be dug or pulled when the ground is soft and before the seed is ripe, and the plants removed. Badly infested pastures may require plowing and cultivation.

White Snakeroot is a rather tall, unbranched weed, with fine-toothed, three-veined leaves on opposite sides of the stem. It bears a flattish cluster of small white flowers on the top and is rather common in wild or wooded pastures. While it may not always be poisonous it should be regarded with suspicion. Sheep seem fond of it and have died in pastures where the leaves were eaten. It is the weed blamed for the "trembles" in cattle and the "milk sickness' of persons who drink their milk.

Foxgloves (digitalis) and *Larkspur* (delphinium) sometimes grow in pastures and either may cause poisoning if eaten in large amounts. If you can't recognize

them ask the lady of the house.

The Nightshades, both climbing and field, characterized by their red or black berries, are considered poisonous under some conditions, but are probably not as "deadly" as their name would indicate. Bracken, or brake fern if eaten may cause symptoms in cattle closely resembling those of hemorrhagic septicemia, but stock will not bother it unless there is no other forage. Some poisoning blamed on pasture weeds may have been a form of "forage poisoning" due to molds which sometimes form on a rather heavy growth of grasses which were mown and allowed to lie on the ground until partly rotten. Such cases are rather rare.

Many hog lots are simply masses of coarse weeds. Hogs like green feed as well as other stock and are often fatally poisoned by eating the young plants of Jimson weed or cockle burs. These are too well known to need description and are very common in such places. The first leaves of cockle burs are long and slender and quite different from the later leaves. They are very succulent and attractive to stock and extremely poisonous. Young Jimson weed seems equally fatal. Both plants are annuals which should not be hard to eradicate.

It's Producing War Food and Feed

Condensed from Farm and Ranch

Leon S. Wortman
Soil Conservation Service

FROM wind-swept, eroded, gullied, unproductive areas, back to a carrying capacity of 11,745 head of cattle in a period of six years is pretty fast recovery for land. But that comeback represents what has occurred since the U. S. Department of Agriculture Soil Conservation Service in 1938 took 325,228 acre of submarginal, formerly misused lands and put them to their proper use and established the needed erosion control measures and practices.

The 325,228 acres represent a part of the 500,685 acres purchased in Arkansas, Louisiana, Oklahoma, and Texas under the authority of the Bankhead-Jones Farm Tenant Act, Title III, Retirement of Submarginal Land. Under this bill the Secretary of Agriculture was "authorized and directed to develop a program of land conservation and land utilization, including the retirement of lands which are submarginal or not primarily suitable for cultivation, in order thereby to correct maladjustments in land use, and thus assist in controlling soil erosion, mitigating floods, preventing impairment of dams and reservoirs, conserving surface and subsurface moisture, protecting the watersheds of navigable streams, and protecting the public lands, health, safety and welfare."

In two active periods from 1936 to 1939 and from 1939 to 1942, the Government purchased these eroded, mis-used lands in blocks ranging in size from 11,746 acres at Forrest City, Arkansas, to 77,182 acres in Dallam county, Texas, in the heart of the old "dust bowl." Locations of purchases were recommended by local farmers and agencies. An indication that these lands were in a low state of productivity is found in the cost per acre. The lowest cost was an average of $2.57 paid for 35,058 acres in McCurtain county, the southeast county in Oklahoma. The cost on all the lands averaged approximately $6.92 per acre.

The Soil Conservation Service is directing this program of devel-

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opment, management and better use on lands so far gone with erosion and depletion that restoration could not be brought about through programs other than Federal purchase. Tracts of 40, 80 and 160 acres in their original, virgin, productive state returned a satisfactory living under intensive, cultivated use. However, these lands, when not protected by conservation practices, became gullied and nonproductive and were forced into grazing or forestry use. As timberlands or grazing units they were not sufficient to maintain the family.

On practically all tracts of this eroded land the owners and operators had given up hope of continued use of the land. The gullied, cultivated land with little topsoil left would not produce enough to pay the lowest level of wages and taxes; the pasture and range lands with a cover of annual grasses and weeds would not meet the cost of upkeep of fences, water facilities, interest and taxes, let alone return a profit; and the woodlands, because of annual burning, grazing and removal of desirable wood products, presented a raged, depressing picture. As a result, most of the tracts were tax delinquent and many were abandoned and subjected to timber stealing and trespass grazing. Due to continued and pyramiding costs for taxes, interest, management, the need for an adequate immediate family income, and the lack of resources, the former owners faced the "impossible" in attempting to change or defer the use of these lands and develop the land to its proper use. The change in use in many instances meant a shift from cultivation to range grasses, with attendant development costs for purchase and seeding of native grasses and no return for a period of from three to five years. Timberlands needed exclusion of grazing, production from fire, planting of seedling trees and an improvement cutting of the timber stand. These development costs and deferred income could be borne only by some public agency.

In order to aid farmers, on adjacent or nearby land not purchased, in bringing about desirable physical adjustments in land use with a view to bettering human welfare and establishing a permanent and balanced agriculture in the various communities, the development and management of the Government-owned land is tied closely with other lines of action administered by the Soil Conservation Service as a part of a coordinated attack on land use problems.

Around and adjacent to the Government lands are found many farms which, because of small size, eroded condition, lack of grazing land or other reasons,

are inadequate to provide a satisfactory living for the farm operators and their families. These families are given first priority in the use of the grazing and timber harvesting privileges and are given seasonal employment in pasture, range, and forest development work on the projects. Practically all jobs, such as pasture seeding, sodding, fence construction, stock water ponds, and tree planting are the product of this local labor. Some of these jobs are seeding and sodding 33,027 acres, 692 miles of new fencing, 228 miles of old fences repaired, building 41 new stock water ponds, 64 new wells and springs, and the planting of 8 million trees, mostly pine, on over 25,500 acres. Development is well along but much is yet to be done. Almost 41,000 acres on the Dallam county, Texas, Cheyenne, Oklahoma, and Decatur, Texas, projects still need seeding to native bluestem, grama or buffalo grasses. Additional fencing, stock ponds, windmills and corrals are needed and tree planting is still incomplete. Extensive tree planting will be a postwar job, however.

Soil-conservation district supervisors are finding these developed lands an asset to their district programs. For example, in 1943 operators of 656 farm units were cultivating land which should have been retired to grass or trees. They were forced by necessity to switch to livestock to supplement their soil resources, and found on these Government lands the grazing and timber harvesting privileges which enabled them to retire to grass or trees this cultivated land, to maintain the standard of living to which they were accustomed, and, in many instances, to increase the scope of their operations. As development progresses sufficient privileges will become available for 302 additional operators. The major type of privilege was grazing used by 593 operators and harvesting forest products used by 160 operators. This was out of a total of 802 operators using project lands. Selective harvesting of timber, consisting of pine and hardwood logs, pulpwood, chemical wood, posts, ties, and fuelwood products, is under way at the Minden and Bernice, Louisiana, projects where permits have been issued on 110 "forties" or 4,400 acres.

Returns to the Government in the form of fees for privileges granted have increased as development of the lands has progressed. An indication of the contribution these formerly mis-used lands are making to the economy of the communities can be found in the annual summaries which show that in 1939, when the lands were undeveloped, the net revenue to the Government amount-

ed to $1,651.27. Four years later, in 1943, after the land had been put to its proper use and treatment applied to the major portion, net revenue had climbed to $52,104.79. Under terms of the Bankhead-Jones Act, 25 per cent of the net revenue goes back to the counties in lieu of taxes. This year approximately $13,026.19 is being distributed among 27 counties for use primarily for roads and schools.

What has been the contribution of these formerly misused and eroded areas to the war effort? Briefly, it can be summarized this way: In terms of food, approximately 244,200 pounds of butter and more than 3 million pounds of beef were produced on the 181,000 acres of pasture and range. More than 200 separate garden plots were utilized by local low-income families, over 400 bushels of pears and peaches and thousands of gallons of berries were harvested under permit from these lands. Timber products are moving into commercial channels at the rate of 3 million board feet annually.

It is the policy of the Soil Conservation Service for the duration of the war to use these lands to the limit of capability, in accord with sound land use, in order that they may make their maximum contribution in food, feed and wood products. This policy was responsible for a 66 per cent increase in 1943 in number of cattle grazed, and timber harvesting accelerated to ten times the volume of 1942. From present indications, the contribution in 1944 of these formerly misused lands will far exceed 1943.

While these benefits are accruing to local people and to the Nation as a whole, the other objectives outlined in the Act are being achieved. Erosion, of course, is being brought under control; rainfall run-off is being reduced. These are contributions to flood control and to the protection of streams and reservoirs from sedimentation.

Pork Production—By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. The Macmillan Co. $3.75.

Practical Horse Breeding and Training — By Jack Widmer. Charles Scribner's Sons (1942). $3.00.

Repairing Farm Machinery—By Ivan G. Morrison, Asst. Professor Agri. Education, Purdue University. The Interstate Printers & Publishers. $1.80.

Sheep Production—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Ag. Univ. Ky. McGraw-Hill Book Co., Inc. $4.00.

Soil Conservation — By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Department of Agriculture. McGraw-Hill Book Company, Inc. $6.00.

Some Common Diseases of Cattle—By George R. Conn, B.S.A.H., D.V.M. Orange Judd Publishing Co., Inc. (1942). $1.50.

Soybeans—Gold from the Soil — By Edward Jerome Dies. The Macmillan Co. $1.75.

The Farm Primer—By Walter Magnes Teller, formerly with the Farm Security Administration, U. S. D. A. David McKay Co. $2.50.

The Western Horse—Its Training, Type and Marketing. By John A. Gorman, Asso. Prof. Animal Production, Univ. of Wyoming. The Interstate Printers and Publishers. $1.65.

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BOOK NOTES

THE AMERICAN LAND—Its History and Its Uses, by William R. Van Dersal, biologist in the United States Department of Agriculture.
Publishers: Oxford University Press $3.75

AN AGRICULTURAL TESTAMENT — by Sir Albert Howard, C.I.E., M.A., former Director, Institute of Plant Industry, Indore.
Publishers: Oxford University Press $3.50

NATURAL PRINCIPLES OF LAND USE — by Edward H. Graham, Chief of the Biology Division of the Soil Conservation Service.
Publishers: Oxford University Press 275 pages $3.50

ROOTS IN THE EARTH — The Small Farmer Looks Ahead — by P. Alston Waring and Walter Magnes Teller, two independent small farmers who have written out of experience.

This book is a happy combination of the hard facts of farming with the ideals and aspirations of the farmer. The authors contend that the family-size farm can once again provide a solvent and agreeable way of life provided small farmers adjust their social outlook as well as their techniques of agronomy and animal husbandry to the new agricultural situation they confront.

Roots in the Earth is not a book just for farmers but for every American who is interested in establishing on firm foundations that essential part of America's economy which has its roots in the earth.

Publishers: Harper & Brothers 202 pages $2.50

FOR THE FARMER'S LIBRARY

These books are recommended as outstanding in their field:

Animal Sanitation and Disease Control—By Dr. R. R. Dykstra, Dean of the School of Veterinary Medicine, Kansas State College. The Interstate Printers and Publishers. $2.85.

Beef Cattle — By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Sons, Inc. $4.00.

Beef Cattle Production in the South—By D. W. Williams, Head, Department of Animal Husbandry, A. & M. College of Texas, College Station, Texas. The Interstate Printers & Publishers (1941). $2.00.

Chicken Raising Made Easy — By Paul W. Chapman, Dean of College of Agriculture, University of Georgia. (1943) The Macmillan Co., $1.75.

Dairy Cattle and Milk Production — By Clarence H. Eckles, B.S.A., D.Sc., late Chief, Div. of Dairy Husbandry, Univ. of Minnesota. The Macmillan Co. $3.90.

Dairy Science — By W. E. Petersen, Ph.D., Assoc. Prof. and Assoc. Dairy Husbandryman, Univ. of Minn. Edited by R. W. Gregory. J. B. Lippincott Company (1939). $4.00.

Diseases and Parasites of Poultry — By Edgar Hugh Barger, D.V.M., Berkeley, Calif., and L. E. Card, Ph.D., Prof. of Poultry Husbandry, Univ. of Illinois. Lea & Febiger. 3rd Edition (1943). $3.75.

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.

Farm Management—By Robert R. Hudelson. The Macmillan Co. $2.00.

Farm Management and Marketing — By V. B. Hart, M. C. Bond, L. C. Cunningham, all of N. Y. State College of Agriculture, Cornell University. Publishers: John Wiley & Sons, Inc. (1942). $2.75.

How to Raise Rabbits for Food and Fur — By Frank G. Ashbrook, Fish and Wildlife Service, U. S. Dept. of the Interior. Orange Judd Publishing Co., Inc. (1943). $2.00.

Livestock Production—By Walter H. Peters, Chief of the Division of Animal and Poultry Husbandry, Univ. of Minn. McGraw-Hill Book Co., Inc. $3.50.

Livestock Judging Handbook — By Julius E. Nordby and W. Malcolm Beeson, Ph.D., Asst. Professors Animal Husb., Univ. Idaho. The Interstate Printers. $2.60.

Modern Agricultural Mathematics — By Maurice Nadler, B.S., A.M. Dept. of Mathematics, Newtown High School, Long Island. Orange Judd Publishing Co., Inc. (1942). $2.00.

Modern Farmers' Cyclopedia of Agriculture—By Earley Vernon Wilcox, Ph.D., Agricultural Writer, formerly with U. S. Dept. of Agriculture. Orange Judd Publishing Co., Inc. (1944). $4.50.

Plowman's Folly—By Edward H. Faulkner. (1943) Grosset and Dunlap. $1.00.

Poultry—By A. R. Winter, Asst. Prof. Poultry Husbandry, Ohio State Univ., and E. M. Funk, Asst. Prof. Poultry Husbandry, Mo. State Univ. J. B. Lippincott Co. $5.00.

Profitable Poultry Keeping — By H. Clyde Knandel, Prof. and Head, Dept. of Poultry Husb., Penn State College. Orange Judd Publishing Co., Inc. $3.00.

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It is one of the trio of state farm papers in Ohio, Pennsylvania and Michigan, published by Capper - Harman - Slocum, Inc., of which Senator Arthur Capper is president. General manager of the company is Neff Laing, one of the well-known figures in agricultural publishing and who is just finishing his fiftieth year in the business. Its tradition of faithful service to the farmers of its state established by a long line of able editors is being carried on by Editor R. T. Kelsey and his corps of staff and contributing editors.

The Ohio Farmer is published at Cleveland, Ohio, and its subscription rate has remained at its pre-war price of fifty cents per year.

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